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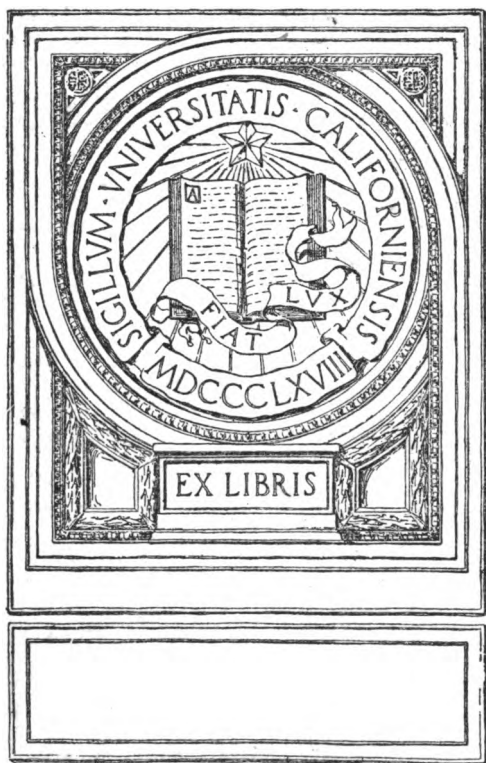
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THE MAKING AND THE UNMAKING OF A DULLARD.

By

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Author of
"The Education of Our Girls"



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**To the Misunderstood
Children**

Who are reached the stone of discouragement instead of the bread of hope and who are branded "dull and backward" when laid upon the Procrustean bed of closely graded schools

This Book

**is Dedicated in Loving
Sympathy**

192860

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PREFACE

Though recent progress in educational theory and practice has for the most part kept in view the normal child and the development of normal faculties, it is gratifying to note a growing interest in those less fortunate children who, for one reason or another, fall below what might be called the level of school intelligence. That the organism should have its pathology no less than its physiology is the plain requirement of common sense as it is also a scientific necessity. Likewise it is clear that psychology of the normal mind must find its counterpart in the study of mental disease. And now that the advance of knowledge has made possible a more thorough diagnosis and a more successful treatment of those defects which hinder the growth of the mind, it seems reasonable to hope for something like a system of educational therapeutics which will turn toward the school many children who would otherwise go their way to the asylum.

The Catholic Church from the earliest times has put forth the most earnest efforts to bring the blessing of education within the reach of those to whom nature seemingly refused the power or the opportunity of learning. In Rome especially, the Sovereign Pontiffs have been careful to provide institutions for the blind, the deaf, and other classes of defective children. The Holy See has also blessed and encouraged those associations of unselfish men and women who have given their lives to training such children in knowledge and virtue. And it is pleasing to see upon the pages of educational history the names of many individual Catholics who have made valuable contributions to the method of treating the less gifted or hopelessly dull and backward pupils to be found in every school.

The work which Dr. Shields has prepared is certain, in my judgment, to interest and assist all those who are concerned with the education of defectives. His study of the dullard is based on a thorough psychological insight; but what is more important, it is evidently inspired

by a hearty sympathy for the parents and teachers upon whom the care of such children must devolve. I sincerely trust that this careful analysis and the numerous suggestions which are offered in his pages will be at once an enlightenment and a stimulation to his readers.

The book has been cast in the form of a dialogue which permits an easy presentation of the author's ideas while it offers full scope for the discussion of some delicate problems in psychology. I feel sure that in thus surveying the subject from various points of view Dr. Shields will not only open up new lines of thought where much serious thinking is needed, but will also create for the dullard a sympathy at once sincere and intelligent that will go far towards making of these unfortunate little ones useful men and women.

D. J. O'CONNELL,
Rector, Catholic University.

INTRODUCTION

The dullard is the trial of every teacher, and he is the prolific source of heartache and humiliation to his parents. His days are eked out in discouragement and the future stretches out before him a barren waste with no ambitions beckoning to him and no ray of hope to illumine his path. And yet, he has a soul to save and a life that must be lived out among his fellows, whether in honor or in dishonor. Misunderstood by his companions, abused by his superiors, held up to the school as an example to be avoided, the butt of ridicule for the smart, jeered at by the thoughtless and the ill-bred, with all the currents of life soured and turned back upon their source, the dullard too frequently finds his way to the Juvenile Court and from thence he passes on to recruit the ranks of the vagabond and the criminal.

✓ The dullard is sometimes born to his low estate, but he is more frequently the product of mistaken educational methods in the home

and in the school. He is not a rare visitant; his number is increasing rapidly, particularly in the schools of our large cities. According to conservative estimates ten per cent of the children attending the public schools of New York City must be classed with the dull and backward. Dr. Groszmann, a competent authority on the matter, is responsible for the statement that there are from six to seven atypical children in every schoolroom in Newark, N. J. Those two cities do not constitute a striking exception in the number of these unfortunate children to be found in the school population.

People of philanthropic tendencies are much exercised over this deplorable state of affairs and they are ready with various remedies, such as more frequent bathing, more abundant food, sanitary housing, settlement work, fresh air excursions, etc., but there is little hope of reaching a permanent cure until the case, with all its difficulties, is fully understood and the contributory causes laid bare.

It should be observed at the outset that the educational failure of our present school system is not confined to dull and atypical children. Recent evidence, such as that furnished by the West Point examinations and by the Boards and Committees appointed to investigate public education in various parts of the country, points to the fact that there is something fundamentally wrong with the school system, since it is grinding out dullards in ever increasing numbers and failing to bring even the brighter children up to a reasonable efficiency in those matters which constitute the staple of the curriculum.

Educationists of varying degrees of proficiency and of all shades of pedagogic belief are at work on the problem. Child study, genetic and applied psychology, and sociology have each made its contribution. Remedies have also been offered by the advocates of moral and religious training, of physical culture, of athletics and of industrial and technical education. The literature of the subject

is growing rapidly, but it may be questioned whether we are as rapidly approaching a satisfactory adjustment of the school to the needs of the child.

This book, it is believed, may contribute something towards the solution of these problems. It is cast in popular form in the hope that it may reach parents and the pupils who need its message as well as the more technically trained workers in the field of education.

The story of Studevan's omadhaun is in no sense a creation of the imagination, nor are its facts gathered from various sources to be moulded into one for the purposes of pedagogical exposition. The story in its entirety is a faithful transcript of the record that was burned into the heart and brain of the omadhaun and read by himself years after he had fought his way back to the company of normal and intellectual men. It has a message of courage and hope for the dullard, who will probably be the only one to fully appreciate its force, but it can hardly fail to awaken in

the hearts of parents and teachers a deeper sympathy for these unfortunate victims of mistaken educational methods and to give a keener insight into their condition, nor will the book be found devoid of suggestions for those who are engaged in the elaboration of methods and the shaping of educational policies.

It is vain to treat symptoms instead of disease, yet nothing more is possible until we fully understand the causes of the evils of which complaint is made. The problem is usually approached from the outside. The dullard is observed as if he were a frog or a tadpole by the educationist who has no light to guide him but that derived from the memory of successful school days and a brilliant educational career. Dr. Studevan here presents the frog's point of view and he has something to say which is well worth listening to, even if you, in your superior wisdom, should find reasons for differing from his conclusions.

The problems discussed in this book have a

bearing also on the education of normal children. It is more than probable that the same causes which are producing the ever increasing number of dullards are also operative in the production of the less aggravated forms of the malady exhibited in the general retardation of public school pupils to which reference has just been made. When these causes are fully understood, we shall not have far to seek for effective remedies.

The average child spends only a small fraction of his time in school. To understand the influences which are operating upon his developing mind and character we must take a view that is much wider than that afforded by the school. The child's home, his companions when out of school, his vacations, and the influences exerted upon him by his occupations, must all be taken into account by those who would understand and intelligently guide the processes of his unfolding life.

The profound social and economic changes of the past few decades have completely transformed the environment of our children. The

old educative forces, developed through countless generations, have been destroyed and nothing equivalent has been found to replace them. The school must take over this new burden and this new responsibility. It must do for the children of this generation what the industrial home of the past did for the children of former generations. The parent and the teacher, in too many cases the product of the older home conditions, have no key to the child's mind and heart and, as a consequence, are unable to maintain their supremacy and to guide him prudently in the situations which confront him. Their own education was rooted in muscle and sense training, in industrial processes and in real duties, but these things were not considered by them in the light of educational forces. The supplementary school drills in the three R's stand out in their consciousness as the sum total of their education and they are amazed today at the fact that children who receive far superior drills in these subjects remain lamentably deficient in intellectual power. They do not realize that the children of today

are wholly deprived of the best educative influences that were operative in their own childhood.

Recent social changes are not less pronounced than industrial changes or less far-reaching in their effects upon our children. The father and the older members of the family are compelled to seek employment outside the home, and the children are thus deprived of their companionship and protection. The child begins his individual life in almost total dependence upon his parents, and during the period of his development he leans upon authority in every phase of his intellectual and moral life. During adolescence his mind comes under the dominion of intrinsic evidence and he gradually learns to shape his conduct freely in the light of the truth which he assimilates, but even in the highest reaches of mature development such self-determination affects only a small part of life.

The teaching of positive religion, national customs, and family traditions in the past determined the conduct of the child and of the

man. Today, the environment of the child, particularly of the child brought up in our cities, is such as to destroy all reverence for authority and to break the force of creeds, national customs and family traditions that have played so large a part in bringing to balanced maturity the minds and characters of our forefathers. The conflict of various national customs tends to make all such customs absurd to the child. "Frenchy," "Dutchy," "Paddy," "Dago," "Polock," etc., are terms which soon make the sensitive child seek to escape from the thralldom of national customs and to avoid all those practices which would differentiate him from his fellow pupils. These children soon cease to look upon their parents and their own people with reverence or to treat with respect the opinions and the practices of their forefathers. Similarly, the conflict of creeds, inevitable where the children of many religious denominations mingle freely, results in robbing these poor disinherited children of the support which their fathers found in the teachings and in the practice of their religion.

These evils, instead of being alleviated in every possible way by the school authorities, are usually aggravated by unwise and short-sighted zealots who, in order to produce good citizens, would gladly destroy national customs, and who, in order to produce broad-minded men, would remove the authority and the positive teaching of religion. Under these conditions the immature mind and character of the child is suddenly deprived of all those helps that nature intended should be present to support and sustain him until his mind reaches maturity. From the day he enters school he must be able to rely upon his own intelligence for guidance in all those matters that have been the chief concern of the noblest and wisest among the children of men since the dawn of human history. These zealous levelers of national customs and religious beliefs seem to forget that the adult may draw upon the experience of the race, while the child has only his own inexperience to look to for guidance. And just when all this burden of determining lines of conduct and of building

character is placed upon the child's budding intelligence the old and tried educative forces of the industrial home are swept away by modern economic conditions.

Sense training, participation in complete industrial processes and the steadying influence of real duties have dropped away from our children and to supply their place the schools offer a more elaborate program of the three R's and a strictly formal academic discipline. This aspect of the school situation was well summed up in an address delivered recently before the Century Club of Detroit by a public school man of wide experience who labored for many years with marked success in the public schools of Chicago and who is now principal of a high school in New York City.

"Every loss sustained by the home was claimed by the school, but instead of supplying that diversity of industrial experience which the young folks were losing, the school continued to develop upon its bookish side until it almost completely separated the children from the original instinctive interests of

life. In place of supplementing and varying the child's existence, the school, by enlarging a supplementary service into a principal consideration, has brought us to the spectacle of systematic education ignoring the instincts, tastes, and desires of its material, judging of its needs by its own historically narrow standards, possessed of great influence by the persistence of a tradition once adequate, endowed with tremendous strength by the perfection of a legalized system, but developing the race on a plan appallingly warped and one-sided. The public school is demanding more and more of the children's time for its, as yet, unjustified purposes; little children are loaded with books beyond not only their mental but their physical strength. The parent who would play with his children must yield to the inexorable demands of school work at home. The schoolmaster growls at music lessons, whines at dancing school, bemoans the children's party, and claims the whole child, for what?—for the things that my frank up-the-state friend says are the only things our public

schools sincerely care for: reading, writing, ciphering, a few facts of geography, history and science, that is all. Personally, I had very much rather not have my own children develop into the type proposed by the schoolmaster. I have the feeling that in the children themselves are suggestions more worth following than the artificial, one-sided, and isolated bookish ideas that educational systems have set at the center of their plan. In this, if I read the papers correctly, I am not unique. The prevailing note of comment on public education is that it has not made good."

✓ This summing up of the situation is typical of much that is being thought and said on the subject at present. The schools have failed to adjust themselves to the new conditions of the child. They have failed to reach his vital interests, and hence an army of truant officers is required to compel attendance. The Massachusetts Commission says, "There is a vague feeling of dissatisfaction with the results of the existing public school system. The schools are too exclusively bookish in their spirit,

scope, and methods." Children under sixteen are not usually employed in the factories of Massachusetts, the law does not compel children over fourteen years of age to attend school, and Dr. Kingsbury has shown that 25,000 children, between the ages of fourteen and sixteen, in the State of Massachusetts alone, are out of school and idle for the most part. The schools do not attract our children. The attendance laws are requiring more and more executive agents and are costing more and more money to enforce. We are compelling multitudes of our children to take what neither they nor their parents want. If the education given in our schools reached the lives of our children and lifted up the children and their parents as it should, we would have a different story to tell.

In this book an attempt is made to show some of the things that render school life odious to the children, some of those things that make truants and dullards out of the best of children. Minds with the greatest strength at maturity often develop slowly in early child-

✓ hood, and these have frequently been humili-
ated and discouraged by the ignorant teacher
who mistakes their condition for congenital
idiocy, native perversity, or unredeemable laziness.
Again, smell and taste, touch and muscle sense, lie deep in the nervous system and are the earliest to develop. They lend strength
— and vigor to the mental content derived through the eye and the ear. And our schools, ignoring this, too frequently appeal to the eye and ear alone at a time when the brain is not ready for development in these directions, with the result that children, with all the fair promise of future greatness, are rejected and branded as dull and backward, to be driven from the school in discouragement and revolt and to add to the vicious element of society lives that if properly directed would be found among its greatest benefactors.

Finally, an attempt is made to show the relationship that exists between industrial processes and home duties on the one hand and the development of the child's mind and character on the other. It is not expected, of

course, that other children will go through experiences similar to those that befell the oma-dhaun, nevertheless, in the story of his return to normal conditions, there may readily be traced the power of sensory and muscular training to awaken and strengthen purely intellectual processes. The whole story is full of suggestiveness for those who are responsible for the work of our schools and who are endeavoring to secure a proper adjustment between our educational systems and the new environmental conditions in which our children live.

CHAPTER I

Studevan's Omadhaun

"Dr. Studevan's lecture at our last meeting," said Mr. O'Brien, "brought to a graceful conclusion our desultory discussions on Co-education and the Higher Education of Women; it gave us a pleasant evening and an opportunity to meet a number of delightful people. But we have with us this evening in the two new members who have joined our little circle the best fruit of the Doctor's effort. Miss Russell's presence will add a new charm to our meetings, while her training and her position as model teacher in the Lee School render her eminently qualified to enlighten us on the characteristic features of the modern school-room; and Judge Russell's long experience at the bar and on the bench makes him just the man to keep the peace between Dr. Studevan and Professor Shannon."

"I object to that role," said the Judge, "I

have quite enough of that all day. I came here to learn something about modern education and its methods, which Alice informs me have undergone many radical changes since my school days. I have an ancient grudge against the schoolmaster for cruel treatment that has kept me from following the developments in education."

"If you were attending the schools of to-day," said Professor Shannon, "you might have a grudge of quite another kind. Judging from G. Stanley Hall's article in the February number of *Munsey's* the boys are at present suffering from too much gentleness. Let me read you a few lines from this interesting article:

" 'Many of the boys, especially in the upper classes of the high schools, are so outnumbered that they are practically in a girls' school, taught by women at just that age when vigorous male control and example are more needed than at any other time of life. The natural exuberance of the boy is often toned down, but if he is to be well virified later, ought he not in

the middle teens, and later, to be so boisterous at times as to be rather unfit for constant companionship with girls? Is there not something wrong with the high school boy who can truly be called a perfect gentleman, or whose conduct and character conform to the ideals of the average unmarried female teacher? Boys need a different discipline, moral regimen, atmosphere, and method of work * * * Under female influence certainly—as, alas, too often under that of the male teacher—form now always tends to take precedence over content. The boy revolts at much method with meager matter, craves utility and application. Too often, when the very germs of his manhood are burgeoning, all these instincts are denied, and he is compelled to learn the stated lessons which every one else in the country is learning at his age, to work all day with girls. As a result, without knowing what is the matter, his interest gradually declines, and he drops out of school, when, with a robust tone or opportunity to vent his boy nature, such as prevailed at Harrow, Eton, or Rugby, he would have fought it

through and done well. The feminization of the school spirit, discipline and personnel is bad for the boy. His manners are improved, and in this the woman teacher sees a great excellence; but this is the age when some brutish elements in his nature should have had an opportunity to vent and work themselves off in a wholesome way. If he stays in school, he may tend to grow content with mechanical and memoriter work and to excel on lines of girls' qualities, while failing to develop the best traits of his own sex.' "

"There was no danger of feminization in my school days," said the Judge. "The schoolmaster used a vigorous masculine control which he exercised with his cat-o-nine-tails. When a boy didn't know his lesson he was mounted on the back of a larger boy, while a third applied the cat-o-nine-tails vigorously to the least intelligent part of him. In fact, the schoolmaster didn't seem to think that he had done his full duty by a boy unless he had flogged him two or three times a week."

"The schoolmaster of those days," said Mr. -

O'Brien, "evidently believed in the proverb, 'Spare the rod and spoil the child,' but you must have a very unforgiving disposition, Judge, if you have harbored this against him all these years."

"My grievance is deeper than that," replied the Judge, "although I have never forgiven the teacher for flogging the boys; it was a cowardly advantage that he took because of his position and superior strength. But I suffered in a way that none of the other boys did. The teacher scared me one day into speechlessness, which injured my vocal organs so that I was unable to speak for sixteen years, and I have stuttered all my life as a consequence of that teacher's blundering."

"The schools have changed much since the forties," said Dr. Studevan; "and, though I do not doubt that this change is due, in large measure, to the constantly increasing number of women teachers, still, there are at work other causes no less potent."

"In my early days I had a woman teacher who knew how to handle the birch quite as well

as any man. She sent me home from school as an 'omadhaun' at the age of nine and advised my parents to put me to work on the farm since, in her opinion, there was no hope that I would ever learn anything.

"At the age of thirteen I fell from a load of hay and broke my arm. While it was mending I was sent back to school, but after two months' trial and a good thrashing I was again returned to my parents with the same verdict. However, I hold no grudge against my teachers. They acted up to the best lights of their time and, as it happens, it was a fortunate thing for me that I was taken out of school and put to work on the farm during those years."

"Aren't you drawing on your imagination just a little?" asked Miss Ruth.

"No, it's all the solemn, sober truth. I was known in all the countryside for eight years as 'Studevan's omadhaun.' Of course I need not add that my teachers and parents and neighbors generally, were mistaken. When I came up out of the darkness and discovered that I was not different from other men I became very

much interested in my own case. It was this, in fact, that gave me my first and my abiding interest in physiological psychology. I could not bring myself to believe that God had given me a soul different from the souls of other boys. I felt that the cause of my condition must be found on the physical side. I have since come to understand that not only was this true, but that my case was simply an exaggerated form of what is to be found in every school in the country."

"Please tell us how you got out of that condition," said Miss Russell. "I have a large over-grown girl in my room. I can't teach her anything and yet she seems to be a good girl and I don't believe she is an idiot."

"Have you been able to clear up your difficulty, Doctor?" asked Miss Ruth. "When did your real mental development begin? Did some teacher who understood your case give you just the kind of help you needed?"

"No; teachers had nothing to do with it. I don't object in the least to telling you all about it; but it is a long story and one that I fear

has more interest for me than it can possibly have for any one else."

"I don't see how you make that out," replied Miss Russell. "The dullard is the trial of every teacher's life. And, since you have passed through that phase of existence yourself, you should be able to help the rest of us solve the problem. But, of course, I don't wish to pry into your personal affairs, though I confess I'm dying of curiosity to know all about it."

"As to that," replied the Doctor, "you need have no fear. I am not the least bit sensitive on the subject. My own case has caused me to understand a great many things that would otherwise have remained a sealed book to me. I have often told the story from the lecture platform. As you may realize, I have a deep sympathy for the over-grown, dull boy who is misunderstood by everybody; and if this chapter in my own life will serve in any way to bring help to him, I am quite willing that it should be used for that purpose.

"I will tell you as much about my case as

you care to listen to at another time, but to-night I want to hear your father's story. I have known the Judge for many years without having suspected that there was such a tragedy in his life."

CHAPTER II

A Diagnosis

"Judge," said the Doctor, "won't you please please tell us what caused you to remain dumb during a period so far exceeding that of the speechlessness of Zachary?"

"I would much rather hear an account of your case, Doctor, all that I know of my dumbness is soon told.

"I was born in 1840, and I must have been a precocious child for I went on the stump for President Polk in 1844, while still in curls and pinafores. I was out on the front of the stage one night, reciting a little speech for Polk, when some of the scenery behind me fell and caught fire, and the stage manager swore like the son of a sea cook. I was frightened to death."

"Was it the stage manager's tall talk that struck you dumb?" asked Mr. O'Brien.

"No, that calamity befell me on my first day in school three years later. We lived in a lit-

the village and the teacher boarded at our house. I could read quite well before I went to school, but the strange surroundings made me bashful and when the reading class was called, I remained in my seat. The teacher ordered me to join the class, but I only sucked my thumb. At last he came down to my bench. I wanted to read to him alone but he wouldn't listen to me. I think he wanted to show the rest of the class how well I could read and my conduct irritated him. He grabbed me by the collar and yanked me out of my seat and shoved me into the fourth or fifth place from the head of the class. I was scared stiff and when it came my turn to read I couldn't utter a word. This frightened me still more. I felt that there was something wrong inside of me and I began to bellow. After the other children were dismissed that evening the teacher and my brothers and sisters scolded me for having disgraced them and ridiculed me for having made such a fool of myself. I tried to answer them but I could not, and as soon as I got outside I ran as hard as I could to my

father's office. Daddy and I were always chums and I felt that I could tell him everything, but when I got there I couldn't get a word out. This scared me so that I fell on the floor in a faint, and I have no recollection of what happened for some days afterward."

"Wasn't a doctor called in to attend you?" asked Dr. Studevan.

"No," replied the Judge. "I was up and around shortly. There was a sort of fatalism about my people; the fact that I was unable to speak convinced them that I was an idiot. They were sorry for me and hopeless about it; that was all. I think my father was the only one who declined to accept that as a solution of my case.

"I went back to school after a while and listened to what the others were saying. In fact I got along in the ordinary subjects about as well as the other children.

"There was nothing wrong with my understanding, nevertheless, for a long time I made no effort to talk. After I had learned to write I used to hang a slate around my neck and

write my answers whenever it was absolutely necessary to reply. When I was nineteen I undertook to edit a country newspaper at which I worked four years. I used to lock myself in a back room and it would have been easier for any one to get at the Czar of Russia than to get at me. The paper was good enough of its kind for that day, but of course it wouldn't look like much now."

"How did you overcome your stammering and learn to talk?" asked Miss Ruth.

"As you see, I never did get over it; I have stuttered all my life. When I was twenty-three years old I moved into the city and secured a position on a large daily, where I soon found that I could not get along without talking. I realized that I would have to learn to talk or remain a hewer of wood and a drawer of water all my life, so I determined to talk. My first attempts were very painful; I often fell on the floor from sheer exhaustion in my efforts to get out a word."

"Didn't you try putting a pebble under your tongue?" asked Professor Shannon.

“Oh, yes, for some years I was a perambulating stone quarry; but I want to say right here that old Demosthenes didn’t know what he was talking about. He went down to the sea and shouted so as to make himself heard above the roar of the waves; it was this that helped him. I could always sing; and after I had made my first efforts to talk I found that when I got out in the woods I could recite poetry, that is, if you call the *Lady of the Lake* poetry. *Marmion* and *Douglas* was my favorite piece. For a while I found it very difficult to get started, but once I got out the first few words, the swing and rhythm of it carried me along. I indulged in this exercise very frequently and found that it helped me more than anything else. That’s all I know about my case, except that I’ve no Adam’s Apple and it seems to me that there is something wrong with my vocal cords.”

“No,” said Dr. Studevan, “from what you tell me, I judge that the trouble was purely cerebral.”

"Well, just feel of my throat, Doctor; it is not like other men's throats."

"Why, yes, Judge, I find that your throat is all right. Here is the Adam's Apple. It is located just a little higher than usual and it is covered by this fat on your neck. Your voice is strong and resonant and the fact that you could sing during your period of dumbness is evidence enough that your vocal organs were intact. Did you ever use tobacco, Judge?"

"Yes, I attempted to chew once, but I swallowed the whole thing and in a few minutes I was trying to pull the tacks out of my shoes; but I have always smoked; in fact, between the ages of sixteen and twenty-three I was a heavy smoker. But after I began to talk I found that one cigar increased my difficulty in speaking fully fifty per cent, and that two cigars smoked in succession rendered it almost impossible for me to talk for several hours, and I felt the effects for many days."

"How about drink?"

"That had just the opposite effect; I have always taken a glass of whiskey on occasion and

I have found that it rather helped me than otherwise."

"All this confirms my diagnosis. The trouble was certainly cerebral."

"Doctor, my brain was all right," insisted the Judge, "I could understand things as well as anybody else. It was only the machinery of expression that was out of order."

"I grant that, but it was the cerebral part of the machinery and not the peripheral organs."

"How do you explain the case?" asked Miss Ruth.

"That is a long story and it is very difficult to strip it of technicalities. Moreover, any detailed explanation involves matters that are more or less speculative. The complex musculature of speech in all right-handed persons is under the control of a group of nerve cells in the third left frontal convolution of the brain. These cells in turn are governed by cells in the temporal lobe, which underlie all our consciousness of sound, or by cells in the back of the brain that underlie our consciousness of vision.

"When we read, the visual image of the word rests on a set of nerve currents in the occipital lobe in the back of the brain. These currents flow out along definite nerve paths to the speech-center and there discharge the appropriate nerve cells. When we are speaking from the memory of the sounds of words, it is the cells in the temporal lobe that control the speech center.

"The little boy, I take it, was of a highly nervous type. His nervousness was probably accentuated by the accident on the stage, and when the teacher dealt with him so roughly, the nerve tension rose above the normal limit, and overflowed the normal channels, so that the currents failed to reach the speech-center in the proper co-ordination to govern the vocal organs.

"The high emotional state induced by the novelty of his surroundings on his first day in school probably added to the difficulty; but all this would likely have passed off without doing much permanent harm were it not for the fright that resulted from his futile attempts to talk.

He had no understanding of what was the matter with him and, on being suddenly struck dumb, fear took possession of his little soul. This fear was further increased by his subsequent futile attempts to explain the matter to his brothers and sisters and to his father, and, coupled with his failures, it was burned into his brain by nerve currents of extremely high tension. The result of all this was a permanent brain impression that continued to exert an inhibitory influence on all his subsequent attempts to speak."

CHAPTER III

The Mental Record

"There is some direct relation between the emotional tension and the permanency of the mental record," said the Doctor. "Our earliest remembered impressions are usually the result of some exceptionally high emotional state, such as the Judge's clearly defined picture of the happenings on the stage that night when he was scarcely four years old.

"What is the first thing you remember, Miss Ruth?"

"My earliest impression," replied Miss Ruth, "was of the first and only spanking I ever got. My mother went down town one day and before going she cautioned me not to leave the house under any circumstances until she should return. Now, I had a Tom Sawyer sweetheart living next door who came for me shortly after mother left, and he insisted that I should

go with him to his attic to see a wonderful old clock that he had unearthed. I thought I would be back before my mother got home, but missed my calculations and mother gave me a good spanking for my disobedience.

“I was filled with anger, but my predominant feeling was one of disgust. I was ashamed of my mother and was quite overcome by the thought that she should treat her little girl in that way. It took me a long time to get back my respect for her. She must have seen that the effect of the whipping was bad, for she never repeated the experiment. I was not quite three years old, but I remember all the details of those few hours as vividly as if it were but yesterday. I have no recollection of anything else that occurred for nearly a year afterwards.”

✓ | “How careful parents should be of the impressions made on children in their emotional moments,” said Mrs. O’Brien, “if the record becomes so permanent.”

“Teachers, even more than parents, should bear that truth in mind,” said Miss Ruth, “since its obverse shows how little value is to be

attached to the cold, routine teaching of children."

"You are quite right," said the Doctor, "it is true at all times in life, but particularly in childhood, that all permanent impressions are made in a large solvent of feeling."

"That provides a good justification for corporal punishment," said the Professor. "Associate disagreeable impressions with a large solvent of feeling generated by the birch and attach these to wrong conduct and you cure the child's budding tendency to crime."

"Recent vital statistics," said the Judge, "show that there has been a very marked increase in juvenile crime in recent years since corporal punishment went out of fashion in our schools, but I never thought of connecting the two things."

"Do you really think, Doctor, that it would be well to return to corporal punishment?"

"No, I am a very decided opponent of corporal punishment, nor can I believe that the Professor is so benighted as to advocate a return to the birch. The whole spirit of the Christian religion is away from the govern-

ment of conduct through inhibitions. It is no longer 'Thou shalt not,' but 'Thou shalt.'

"Civilization is one long record of the failure of punishments as deterrents of crime. In the ancient days every time a traitor was drawn and quartered and his head placed on the city gate, treason multiplied within the walls. Experience has proved that public executions are demoralizing and, in the interests of morality, they are suppressed in most states. It is worthy of notice, too, that the few states of the union in which capital punishment no longer exists have a lower percentage of murders than any of the states that inflict capital punishment for this crime.

"But to return to the home and the school-room. We should make use of the emotional states of children to build up in their lives lasting impressions of noble conduct, right living, and high ideals. Childhood, at least, should be saved from contact with wickedness and from the necessity of inhibitory impressions."

"Doctor, is stammering usually caused by some occurrence similar to that in my father's case?" asked Miss Russell.

"Yes, in a measure, I take your father's case to be typical. It is somewhat extreme, of course. The circumstances vary, and the degrees of injury vary, but the underlying causes are, for the most part, much the same. It is fear that he is going to stammer that makes the stammerer stammer. Sometimes, however, the first stammering is produced by the child's inordinate haste to deliver himself of his pent-up feelings, and the case grows aggravated by repetition and by the added fear on the part of the child that he is going to stammer.

"This phenomenon, however, is not confined to stammerers; something very analogous is responsible for much of the stupidity and dullness in those pupils of whom we hear teachers so constantly complain. The worst effect of failure in any line is not the immediate effect but the permanent memory of failure, which for years blocks the way to subsequent success. Will you not tell us of your dull girl, Miss Russell? I shall be surprised if we do not find that there are some of the same elements in the case."

"From your explanation of my father's case,

Doctor, I think I am beginning to understand what was the matter with Agnes. When she came to me a year ago, she had just passed into the seventh grade. She was fourteen years old, large for her age, and fond of out-door sports. She was her father's chum and could throw a ball, drive a colt, or paddle a canoe as well as any boy. But in the schoolroom her mind worked slowly; she had no confidence in her mental powers; her expression was dull, I used to think it sullen. She caused me much trouble by her fits of stubbornness. When called upon to recite at these times, her answer was invariably, 'I don't know.' When I insisted upon her attempting to talk upon the subject under consideration, she stood in sullen silence and the most I could get from her was, 'yes, no,' or 'I don't know.' When I persisted in my attempts to get from her some expression of original thought, or even a repetition of the words of the author or of another pupil, she grew tense and white about the mouth. But I stupidly thought that she was stubbornly resisting my attempt to get her to do what she was determined not to do.

"On one of these occasions I said to her, in desperation: 'Agnes, open your book and read aloud what the author says.' She looked at the printed page for some time without uttering a word, and I wondered what she would do next. Finally, the words came with an explosion that revealed the effort it required to bring them forth, and I was overwhelmed with remorse for my rash judgment and for my unintentional cruelty.

"From the explanation that you have given of my father's case, I am inclined to think that Agnes's vocal chords were paralyzed by stage fright. She knew that in the schoolroom she was slow; and she believed herself stupid because she could not always understand the lesson and she could not learn it unless she understood it. She admitted to me afterwards, in a burst of confidence, that she never really expected to learn her lesson when she sat down to it; and that when called upon to recite she was unable to speak. The recitation period was for her one long-drawn-out torture in which she endured without protest or explanation, the agonies of failure and humiliation."

"I have come to think," said Miss Ruth, "that the 'I don't know,' of the dull pupil often means 'I was not quite sure about that when I came to class and your calling upon me has frightened away every idea I had on the subject; I really can't think when you and the class are looking at me.'"


"Indeed, my own college experience furnished an absurd illustration of this phase of school life. I felt myself weak in physics and I still stand in awe of the Sister who taught it—a most harmless, kindly woman in herself. She had the unpedagogical habit of first calling upon the student who was to talk and then asking the question or announcing the topic. When she said, 'Miss Ruth,' consternation seized me. Knowing no earthly power would help me, I raised my mind and heart to heaven in prayer, and having got my mind off myself, was able to set it to work when the Sister ceased talking."

CHAPTER IV

Causes of Dullness in Children

"Dr. Studevan," said Mrs. O'Brien, "didn't you say last Friday evening that frightening children made them stupid? Miles says that I was mistaken and that you meant something entirely different."

"I don't remember my exact words, Mrs. O'Brien, but what I meant was that allowing children to fail in the tasks set for them at school is often responsible, in large measure, for their subsequent dullness, and this is particularly true when the children are whipped or frightened or ridiculed on account of their failure. The high emotional state in these cases deepens the impression made by the failure and renders it more effective in preventing subsequent success. Every horse trainer knows this very well. In breaking a young colt he is careful never to hitch him to a load



that he can't pull. And if the colt happens, by some mistake, to be hitched to a load that is too heavy, instead of whipping him, he soothes him and unhitches him. When a green hand adopts the opposite course he makes the colt balky and the more he beats him the more balky he becomes. I remember once seeing a brutal man build a fire under a balky horse, but instead of going the horse lay down on the fire and quenched it. The balky horse simply can not pull. The memory of his past failures prevents him from liberating the nerve energy required to move his muscles.

“Of course there are many profound differences between horses and children, but we are here dealing with a fundamental law of physiology that holds for children and for men as rigidly as it holds for horses. It is made manifest in the difference between a defeated and a victorious army. Every general knows that victory adds to the power of his army, even though it has cost heavily in men and ammunition. The experience of every day brings home to us the fact that we rarely succeed in doing anything that we believe we can not do.

Faith in ourselves is one of the indispensable conditions of success."

"I have always thought," said the Judge, "that heredity had a great deal to do with stupidity. The children of some families are all bright, whereas the children of other families are, sometimes, all stupid."

"That doesn't always follow, Papa, there are five of the McKinnen children in our school. Annie is the brightest girl in her class, but the other four are the trial of their teachers. They have been among the left-overs in each grade."

"And then look at the negro children," said Professor Shannon, "it is generally admitted that even the brightest of them lack the power of sustained attention possessed by white children."

"On the other hand," said Miss Ruth, "it is frequently observed that the children of geniuses seldom amount to anything. With a few exceptions, such as the Herschels, father and son, the children of great men are never heard of. How is this to be accounted for if brightness or dullness is due to heredity?"

"Halleck would seem to make brightness or

dullness the result of brain nutrition," said Miss Russell. "He says that if a person lives on a skim-milk diet, he will think skim-milk thoughts, and that the nation proverbially known as beef eaters has furnished the world the greatest literature of all time."

"If we are looking for the causes of stupidity," said Mr. O'Brien, "would it not be well to keep in mind laziness, sheer, downright laziness?"

"Laziness itself needs to be accounted for quite as much as stupidity," said Dr. Studevan. "I don't think we can admit it among the primary causes of stupidity."

"In my experience," said Miss Ruth, "defective sense organs, particularly defective sight and hearing, are frequently responsible for the backwardness of pupils."

"Is not sickness often responsible for children's dullness?" asked Mrs. O'Brien.

"Yes," said Dr. Studevan, "and we might as well add two more to those five causes of stupidity and so complete the list of capital sins; unfavorable environment and alternating phases of physical and mental development. If we would understand and remedy any case

of stupidity the first step must be to gain a clear understanding of its cause or causes. Each case has its individual history and until this is mastered we are blundering in the dark."

"I was as much surprised," said Professor Shannon, "as any of you by the references which the Judge and the Doctor made to their own boyhood, but I took it for granted that they were coloring matters a bit, or at least that their cases were very rare, until I found this article in the Brooklyn *Eagle* last Sunday. It is astonishing how many idiots we have amongst us. Just listen to this: 'A statement was recently made by Dr. Maxwell to the effect that of the 536,000 pupils of New York City's public schools no less than 200,000 were abnormally old for the classes in which they were studying.'"

"Why, is it possible," exclaimed Mrs. O'Brien, "that nearly half of the children of New York are defectives?"

"No, it is not quite as bad as that," replied Professor Shannon. "The article goes on to state that a large part of this is due to the fact

that foreign-born children are graded in the New York schools according to their ability to speak the English language. But, after due allowance is made for this, it seems that the number of children with whom there is something wrong is very large.

“Dr. Groszmann, who is conducting a school in New Jersey for atypical children, says: ‘The term atypical children has been greatly misused. It has been improperly applied to abnormal and feeble-minded children indiscriminately. The atypical child proper deviates from the average human type to a greater or less degree. It does not necessarily mean because a child is atypical that its capabilities are not so well developed as those of normal children. Frequently it is over-stimulation and precocity that are the causes of the child’s atypic condition. Neurotic and neurasthenic children become atypic, and their nervousness is often hereditary. Other causes of atypical conditions are irritability, perverse tendencies, fears and mental disturbances. Another class of atypical children are those of retarded mental or physical development, and sometimes

both. Through neglect these atypical children may become permanently defective or morally perverse. Another division consists of children whose progress in school was hindered by a change of schools, a slower rate of development, temporary dullness, or physical difficulties. Then there are the children of unusually rapid development without genuine precocity, children who are difficult to manage, mischievous and spoiled children. The atypical child includes the backward child who is not necessarily a mentally deficient child. The precocious child, or the bright child, as we call it, is, in reality, over-stimulated, and in a state of constant nervous exhaustion. * * * A child like this needs expert handling, for a while it may be only pseudo atypical, it is very apt to become genuinely atypical or may even degenerate into an abnormal child.' "

"Isn't Dr. Groszmann juggling with technical terms?" asked Miss Ruth. "He takes as his typical child the average human child. Now, every body knows that individual children are very seldom average children, they all depart more or less from the type that would be

a sort of composite photograph of the group. He might as well make an end of it and say that all children are atypical."

"He evidently means to include only the more pronounced departures from the typical child," said Professor Shannon, "for he makes the statement elsewhere in the same article that in almost every classroom of the public schools of Newark there are from six to seven mentally deficient children, some of whom are even designated as feeble-minded, and he calculates that there are at least ten per cent of the children of the New York schools atypical."

"Isn't that a surprisingly large percentage of defective or atypical children, or whatever you choose to call them?" asked Mrs. O'Brien. "How can it be accounted for?"

"The life of a big city like New York," said Dr. Studevan, "is very abnormal. The mad rush and hurry and the stress of the struggle for existence is enough to break down the adult mind. The effect of this life is transmitted to the nerves and brain of the child. Besides, a big city is the worst place in the world in which to bring up children."

"But aren't the public schools doing anything for these children?" asked Mrs. O'Brien.

"Yes," said Dr. Studevan, "there are many attempts being made to reach this class of children. In the public school at Chatham Square, for instance, they have a special class for them under the care of Miss Farrell. Before the close of school last June I spent an interesting day in her classroom. She is working wonders with children, many of whom would otherwise find their way into institutions for the feeble-minded.* But in Great Britain they have progressed much farther with the work than we have. In her report to the New York School Board, dated December, 1903, Miss Farrell gives an excellent account of this movement in England. The work is some years older on the Continent, where the English authorities sent special teachers to study the situation before inaugurating the work for these children at home. 'The work was begun in London in 1892. Ten years later there were

*Since this was written, work similar to that referred to in the public school at Chatham Square is being carried on in several of the New York schools under the supervision of Miss Farrell.

in the Metropolitan district of London alone, fifty centers each having from one to five classes with a total of 2,359 children under instruction. By an act of Parliament in 1899 this has become a regular feature of the elementary schools of the kingdom. An examination of the pupils gathered into these special classes brings out the fact that the defects are largely due to physical causes. Neurosis, St. Vitus's dance, infantile paralysis, epilepsy, tuberculosis, and other forms of hereditary disease, are everywhere in evidence. The thin arms and legs, the pinched, old-looking faces, and the large joints of these anaemic children all point to inherited disease, to malnutrition, and a vitiated atmosphere. The evidences of sin and poverty and ignorance are everywhere mingled with more or less pronounced marks of mental deficiency.'

"In the University of Pennsylvania there was started some ten years ago a movement which seems full of promise for the solution of this problem. Dr. Lightner Witmer, of the Department of Psychology, has taken up the work in a very scientific way. In March, 1907, he

began the publication of a periodical entitled *The Psychological Clinic*, a Journal for the Study and Treatment of Mental Retardation and Deviation. The Doctor advocates 'the training of students for a new profession—that of the psychological expert, who should find his career in connection with the school system, through the examination and treatment of mentally and morally retarded children, or in connection with the practice of medicine.'

"I received the first number of the *Psychological Clinic* yesterday and brought it with me, feeling that you would all like to examine its contents. Let me read a few paragraphs from the pen of Dr. Witmer in the leading article of this number: 'During the last ten years the laboratory of Psychology at the University of Pennsylvania has conducted under my direction, what I have called "a psychological clinic." Children from the public schools of Philadelphia and adjacent cities have been brought to the laboratory by parents or teachers; these children had made themselves conspicuous because of an inability to progress in school work as rapidly as other children, or because of mor-

al defects which rendered them difficult to manage under ordinary discipline. When brought to the psychological clinic, such children are given a physical and mental examination; if the result of this examination shows it to be desirable, they are then sent to specialists for the eye or the ear, for the nose or throat, and for nervous diseases, one or all, as each case may require. The result of this conjoint medical and psychological examination is a diagnosis of the child's mental and physical condition and the recommendation of appropriate medical and pedagogical treatment. The progress of some of these children has been followed for a term of years.'

"The paper contains an account of a number of very interesting cases. The Doctor gives an account of the case which led to the establishment of the psychological clinic. 'The second case to attract my interest was a boy of fourteen years of age, who was brought to the laboratory of Psychology by his grade teacher. He was one of those children of great interest to the teacher, known to the profession as a



chronic bad speller. His teacher, Miss Margaret T. Maguire, now supervising principal of a grammar school of Philadelphia, was at that time a student of psychology at the University of Pennsylvania; she was imbued with the idea that a psychologist should be able through examination, to ascertain the causes of a deficiency in spelling and to recommend the appropriate treatment for its amelioration or cure. With this case, in March, 1896, the work of the psychological clinic was begun. * * * In the Spring of 1896, I saw several other cases of children suffering from the retardation of some special function, like that of spelling, or from general retardation, and I undertook the training of these children for a certain number of hours each week. * * * In addition to lecture and laboratory courses in experimental and physiological psychology, a course in child psychology was given to demonstrate the various methods of child psychology, but especially the clinical method. * * * At the clinic cases were presented of children suffering from defects of the eye, ear, deficiency in motor ability, or in memory and attention; and in the

training school, children were taught throughout the session of the summer school, receiving pedagogical treatment for the cure of stammering and other speech defects, for defects of written language (such as bad spelling), and for motor defects.'

"This work of Dr. Witmer's seems to me to hold out the promise of great help to the dull and backward children that have been multiplying so rapidly in our schools."

"These children," said Mrs. O'Brien, "always seemed so far away from us, and I have always felt so hopeless about them, but if Dr. Studevan and the Judge, through mistakes of their parents and teachers, were classed with them, is it not possible that many of these children are there by mistake also? I am more curious than ever to hear Dr. Studevan's account of his own boyhood. Won't you please tell us what you remember of it, Doctor?"

"We will keep Professor Shannon still," said Mr. O'Brien, "and see that no one interrupts you while you are giving us the autobiography of "Studevan's omadhaun." I saw a statement the other day to the effect that Dr.

Joseph Wright, Professor of Comparative Philology at Oxford, was a mill hand at the age of sixteen and unable to read. To-day he is one of the most learned men in England. I would give a good deal for his autobiography to add to those of the Judge and Dr. Studevan."

CHAPTER V

Alternating Phases of Physical and Mental Development

"My case seems very simple to me now," said Dr. Studevan, "but it puzzled me for many years. It was only an exaggerated form of what may frequently be found in every school-room in the land. Perhaps it will simplify matters if, at the outset, we eliminate a number of the usual causes of stupidity which had no place in my boyhood.

"Heredity was entirely in my favor. I come of a long-lived, healthy, fecund race. My parents and grandparents reached more than the allotted four score years. I have been unable to find any trace of hereditary disease in any branch of the family. My ancestors, as far back as I can trace them, were well-to-do farmers. They were pious, practical Catholics who felt that the greatest blessing God could bestow upon them was to call a son to the priesthood or a daughter to the convent.

“The physical environment of my childhood and youth was all that could be desired. I was born and raised on a large farm in one of the most picturesque spots in the park region of Minnesota. The air was pure and invigorating, the soil wonderfully fertile and the scenery beautiful. With the changing seasons there was a great variety of occupations in all of which we kept very close to nature and generated excellent appetites which were appeased five times a day by an abundance of wholesome food.

“My mother was an excellent cook. Her table linen was always immaculate. I have never since tasted such bread and butter as she made. There was poultry and fresh eggs and home-made preserves in abundance all the year round. Three times a day the table was served with fresh fruits and vegetables in season from our own garden, with beef or mutton of our own raising, or home-cured ham and bacon. A bulging lunch basket was sent out to us in the fields every day at ten and at four o'clock. Fresh milk was our usual beverage. Every evening from the time I was eight years old until I was sixteen, on finishing my share of the

milking, I used to drain a brimming quart of warm milk, a habit, which linked with my appearance, perhaps, earned for me the sobriquet of 'over-grown calf.'

"My health was excellent. Except for the usual siege of measles and whooping cough I do not believe that I was a day ill during the first twenty years of my life. My senses were normal. I was not a timid child and I do not remember that I was ever frightened, or that I suffered from any accident that would account for my period of dullness; and no one has ever accused me of being lazy.

"So that of the seven causes of dullness enumerated above, six, namely, heredity, disease, environment, malnutrition, defective senses, and fright, are clearly eliminated. My case is thus a peculiarly fortunate one in which to study the dullness that arises from alternating phases of physical and mental development."

"If you will pardon the interruption, Doctor," said the Judge, "I would like to ask a question. I don't mind admitting my ignorance of physiology, and I should like to know

just what you mean by the alternating phases of physical and mental development."

"A full explanation of this physiological phenomenon, Judge, would involve a treatise on the physiology of the nervous system, but stripped of technicalities the important facts in the case are these. All vital functions are controlled by nerve currents. The quality and quantity of every secretion, as well as body temperature, respiration, and the circulation of the blood, depend upon appropriate nerve currents. And not only this, but the nutrition and growth of every organ and gland, of every cell in the body, are dependent upon the same source. A broken bone, for instance, if it be deprived of its proper nerve supply, will never heal.

"On the other hand, the process of mental development, as indeed all the phenomena of consciousness, rest upon high tension nerve currents in the cerebral cortex. Now, it frequently happens that a boy or girl grows very rapidly for a few years, during which period the physical organism makes such demands upon the nerve energy that the cortical tension

is lowered and there is not sufficient nerve energy left to carry on the work of rapid mental development.

“We all know how injurious it is, for example, to indulge in mental work immediately after eating a hearty meal. When food enters the stomach it originates nerve impulses that draw the blood away from the brain for use in the processes of digestion. If brain activity be indulged in at this time, the blood is withdrawn from the viscera and forced into the brain under an increased pressure to furnish the required nerve energy and thus the digestive process is delayed and sometimes the digestive apparatus itself is injured.

“Now, we have a similar conflict going on between mental and physical development. It seldom happens that during childhood and youth the balance is preserved between the growth and development of the body and the growth and development of the mental processes. The extent to which this balance is disturbed and the length of time that each phase continues varies within wide limits.”

CHAPTER VI

The Atypical Child in School

“If you exclude the children who have become dullards through any one of the six causes just enumerated, and arrange the children in any third or fourth grade room in accordance with their physical development, you will find them fairly well classified inversely as their mental capacity, that is, the brightest children will be the smallest and the largest children will be the dullest. Here and there puzzling exceptions to this rule will be found, but these are not sufficient to obscure the general truth.

“The eagerness and ambition of the smaller children, coupled with their quickness of movement, indicate high cortical tension. If these children are constantly over stimulated, as frequently happens, their physical development may be retarded for some years. In extreme cases they are to be found among those children whom over-fond mothers are in the habit

of regarding as too bright or too good for this world. Less aggravated cases not infrequently result in permanent invalidism. This is particularly true of girls when the period of over stimulation is carried beyond the twelfth or the fourteenth year. If these precocious little ones escape disease and death from over stimulation they will finally reach a time in which the balance swings in the opposite direction and physical development, so long retarded, sets in with unusual rapidity. The ensuing mental phase is characterized by lack of energy which to the uninstructed is pure laziness.

“If the pupils are at this time entrusted to incompetent teachers the discouragement into which they fall is likely to degenerate into permanent dullness from which they make no further effort to escape. And thus it happens that precocious children are seldom heard from in after life. I am quite convinced, however, that when the precociousness is not due to inherited or acquired disease this result may be prevented by competent teachers. But in the

present condition of our schools the chances of permanent success are much better where the physical development of the child is in the ascendant during the early years of school life. Here the danger to health from over stimulation is avoided and when at last the processes of physical development begin to slow up, if the discouragement is not too deep, mental life may awaken to a new vigor.

“Either extreme, however, is difficult to manage and may prove dangerous in the hands of incompetent or careless teachers. A balance between the two processes of development is the safest and may be considered the condition of typical children. The development of these children should accordingly determine the work of the grade and their condition should form the ideal towards which the teacher should constantly strive to lead the developmental processes in the atypical children.”

“The atypical children,” said Miss Ruth, “are the cause of most of the difficulty in every schoolroom. If the children could all be made typical by any treatment of the teacher, there would be no hesitancy on her part to apply the

treatment. But even prescinding from the children whose condition is traceable to disease or malnutrition, what can the teacher do for these cases of unbalanced developmental tendencies?"

"Where there is no other complication, she can keep these precocious children from injuring their health by over work and she can save both the undersized precocious children and the overgrown dull children from permanent dullness. Once she understands the case her method of treatment is perfectly clear. The precocious child must be guarded against over stimulation and the dull pupil must be kept from discouragement."

"Do you mean," asked Miss Russell, "that the brighter pupils should be retarded in their progress so that the dull ones may not be discouraged? Is the encouragement of the dull pupil, rather than the strict exercise of justice, the first duty of the teacher? Of course justice demands that encouragement be given to the less bright, but does it not also require that discouragement be not given to the brighter pupils?"

"These are far-reaching questions," replied the Doctor. "I shall endeavor to answer them somewhat more fully at another time in connection with concrete cases. Here I merely wish to register a protest against two procedures which frequently obtain in our schools. Some teachers insist that the instruction and the work of the room should be measured by the capacity of the dullest pupils, while a still larger number of teachers fit the work to the needs of the majority. The motto of the teacher should not be the greatest good of the greatest number but the greatest good of the whole number.

"I do not see that the interests of any of the children concerned are sacrificed by the method of treatment which I have just proposed. The best interests of the very bright pupils are not served by pushing them up through the grades as rapidly as possible. Where this is done it is difficult to avoid over stimulation and when, at a later time, the physical development of these children sets in, it is quite impossible to save them from discour-

agement. They are too far along in their course and now find themselves unable to keep pace with their little classmates. The defeat and humiliation resulting from their failure are likely to prove a permanent hindrance to their further mental development. Of course it will not do to let the bright children cultivate habits of idleness, but the resourceful teacher will find little difficulty in keeping these children busy with collateral work. The precocious children will thus lay up treasures against the day of need.

“The dull pupils must not be given tasks above their present ability and the competent teacher will do everything in her power to encourage and to stimulate them and to awaken their interest in the subjects taught. She will be particularly careful to avoid humiliating them by putting them into competition with children who are, for the time being, their superiors mentally. In this way injustice is done to no pupil and the interests of all are safeguarded.”

“I thank you, Doctor,” said the Judge, “for

your explanation of these unbalanced developmental tendencies, but I am afraid that the ladies will not forgive me for diverting you from the story of your boyhood."

"That story will keep for another time," replied the Doctor. "It is too late to begin on it tonight."

CHAPTER VII

Early Memory Pictures

"You were never more welcome, Doctor," said Mr. O'Brien. "We had begun to fear that you would desert us tonight. Come, take this chair. The glowing embers will stimulate your imagination and help to bring back the scenes of your childhood, in which we have all grown deeply interested. Dido's court was not more attentive to Aeneas describing the fall of Troy than will be your audience tonight if you will tell us, as you have promised to do, how you came to be known as an omadhaun and how you were rescued from permanent imbecility."

"That task is soon accomplished," replied the Doctor. "I was known as an omadhaun from the age of nine to seventeen because I was an omadhaun during those years; and of all peo-

ple in the world an omadhaun is the least able to conceal his mental condition. And as to my 'rescue', that hardly describes the occurrence; I simply grew out of the condition."

"Oh, please, Doctor," said Miss Russell, "tell us about your childhood. You know you promised to give us all the details of your case, and I have been simply consumed with curiosity for the last two weeks."

"I, too, have been looking forward to this evening," said Miss Ruth. "The child has come to be the center of all educational endeavor in our day, hence it is a matter of the greatest importance to all of us who have to deal with children to be able to understand how the child looks out upon the world, to recognize the elements in his developing mind and character that are valuable and that should be cultivated, and also to be able to recognize those other elements which we should as constantly seek to eliminate."

"I quite agree with you," said the Doctor, "and while it has become the fashion for teachers to read many volumes on child study, I

believe that every teacher could use some of this time to greater advantage in making excursions into his own childhood. If he learns to read and understand all that he there finds he will be provided with a private key that will give him ready admission to the minds and hearts of the children who are committed to his care.

"I am not at all disposed to slip away from telling the story of my childhood, but after I have served up my own childhood and youth and dissected them and demonstrated to you the making and the unmaking of a dullard, I shall exact a similar accounting from the other members of this group. The chief interest in my case comes from the fact that the dullards are usually the greatest trial of every teacher. We must not, however, make the mistake of supposing that a study of the dullard will provide us with a full understanding of the more normal types of children."

"The story, Studevan, the story," said Professor Shannon.

"Yes, let's have the story," said Mr.

O'Brien, "and we shall do the philosophizing afterward."

"As far as I can discover, my childhood up to my ninth year differed from that of other children in no important respect," said the Doctor. "There are a few incidents in it, however, which have helped me to understand the later developments. As the waters of oblivion gradually creep up over our childhood, a few of the higher peaks of experience remain above the waves. These islands are very interesting to all students of child nature for they are frequently filled with treasures. Just as the islands out from the mainland preserve for us a record of the fauna and flora that flourished before the islands became separated from the mainland, so these isolated memories of childhood frequently reveal to us early attitudes of mind and early tendencies which it is not possible to obtain anywhere else in an unmodified form. This is well illustrated in the brief life of St. Thomas which is given in the second nocturn for his feast.

"The biographer of the saint tells us that

while he was still an infant in arms he found a piece of parchment on which was written the Hail Mary. The child clutched it in his little hand and would not relinquish it to the nurse, and when his mother took it away from him by force he became so convulsed with sobs and tears that she was obliged to return it to him, whereupon he immediately swallowed it. The same biographer tells us that while the saint was in his early teens he joined the Dominican order against the wishes of his family. His superiors sent him with another Brother to Paris to complete his studies. His family waylaid him on his journey through Italy and imprisoned him in one of their castles. Here they resorted to every conceivable means of diverting him from his purpose but without avail. The biographer finds in the first of these incidents an indication of the saint's future love and devotion to the Mother of God, and in the latter incident he finds a triumph of grace so great that it earned for the saint permanent immunity from certain forms of temptation.

“One need not deny the operations of grace in these incidents and yet find in them natural indications of the saint’s character. Had he been an ordinary child his behavior might appear to many as an indication of bad temper, and his determined opposition to the wishes of his family in any one but a saint would probably be considered a manifestation of self-will and stubbornness. In any case, the incidents show the child and the youth to be possessed of a strong will and a determined character, two qualities that, after the operations of divine grace, are probably responsible in no small measure for the saint’s greatness.

“I only remember two incidents in my own life before I was six years old. And neither of these, I am sorry to say, offers any discoverable indication of future sanctity. When I was three years and ten months old our family moved three or four miles to a neighboring farm. Many of the incidents of that moving come to me now as if they took place but yesterday. I can see the kitchen in the old house as it appeared to me on leaving it that morn-

ing. The empty wood box was in its place behind the stove; the plaster was knocked off the wall just above it. Outside the door there was a broad step, at one end of which was an inverted broken shovel that had served for many years in scraping the mud from the family shoes.

“There was a light snow on the ground. In the front yard there was a mule team hitched to a wagon that was piled high with furniture and boxes; behind this there was an ox team hitched to an empty bob-sled. My parents intended that I should ride in the bob-sled with my mother and the younger members of the family, but I resisted this with so much anger, reinforced with kicks and tears and sobs, that I finally obtained my own way and was allowed to take my place beside the driver on the high seat behind the mule team.

“In our journey we crossed the railroad track and I can still see those two bright bands of steel as they seemed to approach each other in the distance. I retain a clear memory of my feelings as I clung to the back of the seat while

the wagon jolted over the frozen ground, and of my relief when Jake lifted me down from the high seat. My limbs were numb from the long cold ride.

"We entered the front yard through a wicket that sagged open on its leather hinges. I can still see the pebbles on the path and every detail of the front room as we entered it. Mr. Piper, the former owner, was standing with his back to the wall looking up at a pipe protector in the ceiling with its circlet of little holes.

"The other incident to which I referred occurred some eighteen months later. At that time I was the proud possessor of two pairs of home-made, rusty brown breeches. I remember it was an autumn day and I was keeping guard over the pair of breeches that had just left the wash tub and was drying on the clothes horse behind the kitchen stove. I had determined that my wardrobe should not be depleted even to rescue my little brother from the ignominy of petticoats.

"But, alas, courage was never yet a match

for woman's wiles. When the garment was about dry, one of my sisters promised to mount guard for me while the other induced me to accompany her to the corn crib where, for half an hour, I stood fascinated by the golden ears as they came in through the window from my father's scoop shovel in showers and rolled down the pile of corn. On my return to the house I found that I had been basely betrayed; my little brother was strutting around in my newly ironed trousers, and my anger rose to the breaking point.

"The trivial details of these memory pictures are sufficient evidence that we must look elsewhere than to the importance of the subject matter for the causes of the permanency of the mental record. The high emotional tension acts as a fixing agent, leaving upon the mind an indelible record of all the associated images. It is only the strongest qualities of character that oppose high resistance and thus generate high emotional states.

"The first of these incidents indicates strength of will and perseverance, two traits

which are largely responsible for my final escape from dullarddom. The betrayal of the child's confidence and the invasion of what he considered his personal rights were responsible for the second memory picture and indicate, by the indignation which they aroused in the boy, traits of character which are scarcely less important."

"You draw your conclusions so rapidly, Doctor," said Miss Ruth, "that I find myself unable to keep up with you. If the permanency and detail of the first memory picture are due to high emotional tension, how are we to account for the child's remembering the incidents of the journey, such as the crossing of the railroad, and the incidents at the termination of the journey which must have occurred some hours later? Yet there is apparently as vivid a remembrance of the leather hinges on the open wicket, of the pebbles on the path, and of Mr. Piper looking up at the ceiling, as there is of the wood-box, of the shovel doing service as a scraper, or of the two teams before the door. Emotional states are notoriously

short lived in children. However high the child's anger may have mounted when he was fighting for his own way, it must have disappeared as rapidly as an April shower when he was placed beside the driver."

"That is all true," replied the Doctor, "and had no other high emotional states ensued, the memory picture would doubtless have ended with his anger as soon as he was placed beside the driver. But we must bear in mind that that journey was probably the child's first excursion into the unknown outer world where everything was new and strange. He would have been unobservant and phlegmatic indeed had he remained calm throughout the journey.

"Besides, there was another element in the situation which must not be lost sight of. In the old days when we wished to determine which pup out of the litter to raise, we used to catch each one of them in turn by the scruff of the neck and hold it out at arm's length; the pups that squealed were drowned; the pups that had grit enough to keep their mouths shut were raised.

"Do you remember your emotions the first time that you found yourself on some dizzy height? Had the child been put up on the high seat without having struggled for it, the chances are that as soon as the wagon began to move, or as soon as the wheels struck the first stone, he would have cried out to be taken down. But he had committed himself and so all his pride was aroused and all the strength of will that he possessed was summoned to control his fear on that long and perilous ride. The emotional tension generated from these two sources probably remained high to the end of the journey and thus made a permanent record of all the trivial incidents that occurred."

CHAPTER VIII

The Making of a Dullard

“But to return to my story. I was six years and four months old when I entered school for the first time. It was a little village school having but a single room, one teacher and sixty or seventy pupils.

“I had learned to read at home and was reading in Wilson’s First Reader. I was soon promoted to Wilson’s Second Reader and before the end of the year, probably because there was only one other pupil in the class, I was promoted, with my companion, to the National Third Reader. ‘The break between these two readers was very great. ‘Wilson’s Second Reader was a simple affair, not much more difficult than the primer of the National Series, whereas the National Third Reader was made up of selections from the English Classics.

“This was the first serious mistake that the teacher made in my regard. The book was altogether too difficult for me. I had little or no comprehension of the subject-matter of the lesson and the words were frequently too difficult for me to pronounce. My hesitating and stumbling rapidly developed into what my teachers and parents called a ‘stoppage in my speech.’ The humiliation of defeat began to settle into a permanent distaste for reading and a permanent discouragement concerning my ability in that direction.”

“I fared better in the other branches. I knew my catechism by heart before I was nine years old. I could spell and give the synonyms for most of the words in Saunders’ Speller, and I usually maintained my place fairly well in the ‘spelling down’ matches that were a regular feature of the school. My work in arithmetic was considered good; I had finished long division and was working in fractions before I was nine years old. Our geography work, of course, consisted in the usual drill of those days in bounding states, naming capitals and

giving a long series of definitions of geographical terms."

"Oh, I misunderstood you," said Miss Russell, "I thought you said the other evening that you had to learn the multiplication table when you were seventeen years old and that you were then unable to read."

"Perhaps I did say so," replied the Doctor, "but if I did, let me modify the statement. I had to relearn the multiplication table and relearn to read when I was seventeen. During the years that intervened I had practically forgotten everything that I had learned in those first three years at school."

"How did that happen?" asked Mrs. O'Brien. "From what you have just told us, you must have been as bright as the average child up to the time you were nine years old. Did you suffer from an accident at that time?"

"No, there was no accident. My dullness came on gradually and I have no distinct remembrance of the stages in the process. Reading, as I have said, was the only subject in which I have a clear remembrance of failure,

and that left with me a deep and abiding sense of shame and discouragement.

“In the closing months of my ninth year I remember that the other boys used to tease me and play tricks on me and get me into frequent fights. I think I must have been growing very rapidly during this time and probably ceased to make progress in all the school subjects.

“However this may be, on the completion of my ninth year I was kept home from school and put to work on the farm. I did not discover the reason for this until I was about fourteen years old. I was not at all sorry for the change, however, as I had grown to dread school and to hate it. The fields were far more attractive to me.

“I was given a team to drive and dressed out in an over-all suit I felt myself quite a man. I used to get up in the manger to put the bridles on the horses and I had some difficulty in harnessing them. I would give much for a series of photographs of myself at that time and for a record of my weight and height, but unfortunately none of these are available.

“At thirteen years I weighed one hundred and sixty pounds; at fourteen I was my present height, five feet, ten inches. At thirteen I was very strong physically; indeed I did a man’s work in nearly every employment on the farm.

“My nerve energy must have been all used in building up my physical frame. The tension was so low that there was not even a good muscle tonus. I retain a vivid memory picture of myself at that time. I was raw-boned and lanky; my lower jaw hung down continually; the lower lip was heavy and usually sunburned during the summer season. I remember my difficulty in keeping it covered with the skin of an egg to protect it from the sun and wind.

“I spoke but seldom, and when I did attempt to talk, even the members of my own family found some difficulty in understanding me. The boys used to mock me so that I grew afraid of the sound of my own voice. I would not dare attempt to hum or whistle a tune. I was taken to church every Sunday but I was shy and avoided speaking to any one.

"I had practically no boy playmates during these years. The neighboring boys frequently gathered in our pasture on Sunday afternoons to play ball, but I was seldom allowed to take part in the game and I was never allowed to visit or to go away from home."

"Didn't you say the other evening," asked Miss Ruth, "that you returned to school when you were thirteen?"

CHAPTER IX

Into the Depths

“When I was thirteen years old, in slipping off a load of hay one day, my foot caught in the rack and I was thrown out on my side up on the frozen ground. I was not seriously injured except that my left wrist was dislocated. The week following I was sent to school with my arm in a sling. My family was anxious that I should be prepared for Confirmation and they still entertained a lingering hope that I might learn enough of the three R’s to get along on the farm. The teacher was very kind to me; she gave me a great deal of individual attention and tried during the recesses and after school hours to get me started in arithmetic. I do not remember that I made much progress.

“One day in the reading class I was trying to induce a companion to give me some candy.

When he refused I made a gesture that wasn't quite nice and I was instantly aware that the teacher had seen me. I was ashamed of myself and as sorry as I could be; I was also afraid of being punished. It was Friday evening and, when I got away from school without anything being said, I congratulated myself on my fortunate escape and I resolved never to do it again. On the following Monday morning things went on as usual and I felt quite sure that the teacher had decided to overlook my offence, but at the noon recreation she asked me to remain in my place when she dismissed the other pupils, and then I knew that my hope had been vain.

"She reasoned with me and I suppose she expected me to cry, but that wasn't in my line. I was silent and hung my head in shame and if she had had the good sense to let the matter rest there things might have been very different with me; or if she had not alluded to it at all it would have been infinitely better. But she went on lecturing me and finally made the unpardonable blunder of comparing me with my

older brother, whereupon all my contrition instantly changed to defiance. She saw the change in my attitude without understanding its cause and concluded, as she said, that as scolding was useless she would see what a whipping would do.

“She was a muscular woman and enjoyed a well deserved reputation for her ability to wield a black walnut ruler about two feet long, an inch and a half wide and a quarter of an inch thick. She ordered me to hold out my hand and, rising on her tiptoes, she came down with all her might. No boy in the school was ever known to wait for a second application of that ruler, but I sullenly held my hand in the same position and looked the defiance that I felt. My attitude angered her and she applied the ruler the second time with no better effect. I believe I would have stood there until she had exhausted her strength, but she ordered me to leave the room. The blood was just trickling through the skin and my hand was swollen for some days afterward.

“After this occurrence I made no further at-

tempt to work in school. I was in a state of sullen defiance and my old hatred of the school had revived with increased force. Some weeks later I was taken out of school and put to work in the fields. 'And the last state of that man is made worse than the first.'

"While I grew to hate intensely everything connected with the school, I never really blamed the teacher. I knew that my conduct deserved the punishment and I took it as a matter of course, but I was thoroughly discouraged, nevertheless, and I was delighted to escape from the school and its humiliations and burdens.

"As I look back now I realize, of course, that the teacher made a mistake. A wise teacher will overlook many things and I am convinced, after many years of experience with school discipline, that most teachers talk too much.

"My condition from my ninth to my thirteenth year was due, as I have already said, to a phase of abnormally rapid physical development, but this had practically come to an end at the time of my return to school and if

I had been handled properly my mental life might have been awakened at that time and I might have been given a discipline that would have saved me much in the years that were to follow. Teachers, however, are not infallible and mistakes are likely to occur for which they should not be blamed too severely.

"On my return to work on the farm, the realization grew upon me that I was not as other boys. They had brains and talents which I knew I did not possess. I could plow and mow and reap and sow, but I could not imagine what the world was like to those around me who were smart and used to read the papers and keep track of the march of events in the great outer world.

"One day, when I was about fourteen years old, I was lying on a bench outside the dining room window resting after dinner, when my father and mother and my uncle, who was visiting us for the first time within my memory, entered the dining room. Without intending to eaves-drop I overheard their conversation. My uncle was saying, as they came in: 'It's a

shame that you don't try to do something for poor Ed,' and mother replied: 'We have done everything that we could think of but it seems hopeless. The teachers sent him home from school when he was nine years old; they said he could learn nothing but vicious habits from the bad boys who attended school. We sent him back to school last year and the teacher did everything in her power to help him but after three months gave it up as useless. If we could only teach him reading and writing and arithmetic so that he could get along on the farm, we would be satisfied.'

"This was the first intimation I had of the reason which led my parents to keep me home from school. Although I knew in a general way that I had no talents such as other boys possessed, nevertheless, my mother's words came to me like a sentence of condemnation and they crushed me utterly. I slunk away from the bench like a wounded animal and hid myself in the corn field.

"During the two years that followed the gloom and despondency that settled over me

were deep indeed. I used to look at the workmen on the place with a feeling of reverent wonder for they had brains and were as other people and I could no more imagine what the world looked like to their eyes than I can now imagine what this world of eager, struggling humanity must be like to the angels.

"I made no attempt to read; I forgot the multiplication table; and I do not think I could have written my own name when I was sixteen years old. I shrunk more than ever from contact with strangers; I grew silent and sullen. One word of fault finding was quite sufficient to throw me into a rage. My people seemed to understand this side of my character and avoided everything that would anger me.

"In spite of my sullenness I was a rather pious boy during those years. There was no storm severe enough to keep the family home from church on Sunday. We all went to Confession and Communion once a month. No matter how tired I might have been I do not believe that I ever went to bed without saying my night prayers and my rosary. God and the

Blessed Virgin, my guardian angel and the saints were as real to me as the people who surrounded me. Whenever I particularly wanted anything I dropped on my knees behind the plow or in the wagon box and asked for it with far more confidence of being heard and answered than I would have had in making any request from my earthly parents.

"Sometimes I used to dream about my future. A religious vocation occasionally teased my imagination. Of course I did not dream of being a priest, for I knew that a priest had to have brains and had to be a very learned man and besides, my family had set their hearts on my little brother's becoming a priest. He was the brightest boy in school and used to serve Mass on Sundays and they were all very proud of him.

"I had heard people talk about lay brothers whose duty was to work in the fields and to take care of the cattle, and I imagined that I might become a lay brother. Sometimes I used to wonder whether I would be a farmer, but I found it impossible to complete the picture, as

I could not imagine a farmer without a farmer's wife and I never dared to hope that any girl would look with favor upon Studevan's omadhaun."

CHAPTER X

The Awakening

“Jerome K. Jerome, in his essay on ‘The Motherliness of Man,’ said the Doctor, “remarks, ‘to talk like an idiot when you are an idiot, brings no discomfort; to behave as an idiot when you have sense enough to know it, is painful.’ My mental life had reached its lowest ebb in my fourteenth year, and prior to that time my condition caused me but little discomfort, probably because I was not possessed of enough intelligence to realize my condition.

“The pain began with my awakening intelligence in the beginning of my fifteenth year, but many long years dragged by their leaden feet before I understood that the pain was a harbinger of salvation. Those around me had as little knowledge of my awakening mental life as they had of the pain and humiliation that I was suffering.

"My repeated failures at school and the attitude of those around me produced in me an abiding conviction that I did not know anything and that I never would know anything. The struggle between this conviction and my growing mental life continued to my twenty-first year.

"I suppose the pathway that leads up out of the depths is always painful. I have no intention, however, of burdening you with the particular trials that fell to my lot during those six years. I take it for granted that you are chiefly interested in my mental awakening and in the causes which produced it. I retain vivid memory pictures of the incidents that filled out those years, probably because they occurred so late in life, and because of the pain which many of them involved.

"The beneficent role of pain in physical life has often been pointed out. It keeps the child from burning his fingers a second time; it drives the animal to seek food to assuage his hunger and drink to quench his thirst. Pain warns us against danger and compels us to

seek remedies for many of the ills to which flesh is heir.

“All this is just as true of mental and moral life as it is of physical life. It is true in many senses that there is no Easter Sunday without its Good Friday. ‘Unless the grain of wheat falling into the ground perish, it remaineth alone; but if it perish, it bringeth forth much fruit.’ I do not want to preach a sermon on this theme, but it is quite necessary to the subject in hand that we have some realization of the role which pain and humiliation played in the awakening and development of my mental life.

“As I have said, I had reached my present height and weight when I was fourteen years old. The muscles that were soft in the days of their rapid growth soon hardened into strength, and in the exercise of this strength I first tasted the joy of feeling myself equal, at least in one respect, to my fellows. Tom Sawyer touched some of the deeper springs of human nature when he collected toll from his neighbors for

granting them the privilege of whitewashing his fence.

"It was no little thing for me, who felt myself inferior in every other respect to the immigrant laborers on my father's farm, to pass from the lighter occupations assigned to the boy to the harder work of the man. To compete successfully in strength and endurance with men who had passed the golden line of twenty-one, while I was still a boy of fourteen, was to gain some little measure of self-respect and to lay the foundation of self-reliance. To be able to chop as much wood in a day, to hoe as many rows of corn, to shock as many acres of grain as the best man on the farm, did not at the time appear to me as being in any way connected with education, but it did give me a sense of satisfaction that more than compensated for the fatigue entailed. And while deep discouragement and the sentence of condemnation pronounced upon my mental powers barred every other gateway, my budding conscious life found here an avenue of growth.

"From these rude employments I gradually

progressed to others which called for some little measure of skill, such as plowing a straight furrow, building a load of hay, or pitching bundles of grain to the top of a high stack. There were not wanting occupations which developed rapidity of movement, such as husking corn or binding on a harvester. And while I never learned to be precisely a 'broncho-buster,' I delighted in feats of horsemanship in which I acquired no mean skill. I also gradually learned to use the simpler carpenter tools in repairing fences and barns and in building outhouses. We repaired our own farm machinery and I was frequently called upon to assist. My eye was trained to reasonable accuracy of measurement; I could tell a fourteen or a sixteen foot board to within an inch of its length without the use of a measure.

"The constant variety of scene and of occupation that came with the changing seasons provided me with the best possible sensory motor training. This training formed the basis of all my subsequent mental development. Of course I did not realize the value of these things



to mental life, but as I look back upon them now I know that they were my salvation, and that had it not been for them I would probably never have come up out of the darkness.

"No equal period in my school life has left with me treasures comparable in value to those left by those years on the farm while I believed myself banished forever from school and books and human companionship. Those years left with me a sensory-motor training of a high order, a robust constitution, an enduring love of work, self-reliance and a determined will."

"From the way you tell the story, Doctor," said Professor Shannon, "one would be led to suppose that you advocate child-labor instead of play grounds and the axe and grubhoe as substitutes for the gymnasium and the ball field."

"That is always the way with you, Professor, you are supposing and seeing theories everywhere. My only concern was to give you a truthful account of the path my feet took in coming up out of the gloom. If you find your theories embodied in this, I shall be delighted ;

and if you find embodied here theories that displease you, that is not my concern at present. Later, if opportunity offers, we may discuss educational theories in the light of the facts that I am narrating.

“The physical development which I have referred to rather than described, was of course not directed in accordance with any theory or with any deliberate view to education. It was the result of work, not of play, but the circumstances surrounding this work happened to be of the most favorable kind. This was particularly true for a boy in my condition.

“It must be remembered that the work was not that of a factory; it kept the boy out-of-doors and in close contact with nature, and it was not confined to any one occupation. The deadening effect of monotony was entirely absent; all the senses were appealed to in turn. The smell of the fresh up-turned soil, the perfume of the wild rose, and the odor of the new-mown hay are still with me, as are the calls of the cat-bird, the whistle of the bobolink, the humming of the bees and the familiar spec-

tacle of the prairie chicken inviting death by shamming a broken wing in order to divert attention and avert danger from her young.

“With these sights and sounds of nature are inseparably entwined in the tangled skein of memory the outward signs of a human activity that blended with nature’s processes. I can still feel on my feet the soft, wet moss of the meadow bottoms, and see the rhythm of the twenty mowers, and hear the swish of the scythes through the soft grass, and the music of the whetstones on the steel blades.

“The constant change of work that characterized the farm labor of those days must not be put on a level with the unchanging monotony that characterizes the occupation of a factory hand. Another great advantage attaches to the sort of training that we received on the farm; the work is not done for the sake of the training; there is no make-believe about it; it is animated by an earnest purpose; something real is being done every hour.

✓ “The absence of this motive is one of the chief drawbacks to all artificial systems of

training. Exercise that is taken merely for the sake of the training is as incapable of producing the highest physical development as is speaking merely for practice incapable of producing the highest type of eloquence, or as is writing for the sake of illustrating principles of rhetoric incapable of producing a vigorous style. It is true that for young children the play instinct supplies for this earnest motive, but there is nothing that develops character and self-reliance in youth so surely as real occupations and real responsibilities.

"I would not have any one suppose however, that I advocate subjecting other children to such experiences as those I passed through at that time. I am merely trying to trace the educative value of the experiences as they occurred in my own case, which, as every one will recognize, is far from being typical. Nor do I take it for granted that the experiences through which I passed were, in all respects, the best for my own development. Had I been under the direction of some one who understood my case, many things might have been

accomplished for me, and many mistakes, from the evil effects of which I still suffer, might have been avoided."

"It is easy to recognize the value of the physical training that you received on the farm," said Miss Ruth, "and I am beginning to understand where you get your power of work; but granting all that you claim for your sense development and for your motor training, I still fail to understand how these things could have led you back to school. The very joy of work in the open fields, and the flowers and the songs of birds would all seem to render the hated school still more hateful."

"That is all quite true," replied the Doctor, "and such was doubtless the first effect of these things; but I did not return to school for some years and there were several intermediate phases of development which I have not yet touched upon. If you will bear with me a while I shall try to clear up the difficulty.

"The abnormally rapid physical growth that preceded my fourteenth year was followed, as I have already pointed out, by a period of

sensory-motor development in which there was no thought of books or of formal studies. In the beginning of this stage there were only faint glimmerings of intelligence, but as time went on these grew into a distinct phase of intellectual development. Of course there were no sharp lines of demarcation between these several phases; they overlapped and shaded off into each other by imperceptible degrees. The transition from one of these phases to another will perhaps be most readily understood by following the development along certain definite lines."

CHAPTER XI

Development of the Number Concept

"I shall begin with the development of the number concept. At fourteen I had forgotten the multiplication table, but I could count; and while I would have been sadly puzzled if asked to add six and nine, I could have found the result by counting on my fingers. I was not in the habit of using a pencil or a pen, so I did not realize my limitations in any very painful way.

"We used to raise several thousand bushels of grain on our farm. When I was a boy of nine or ten, it was my task to 'hold sacks'; that is, I held the bag while my father emptied into it three half-bushels of grain. Each time the measure was emptied, I lifted the bag so as to pack down the grain; in this way I learned through the sense of sight and through the muscle sense the size and weight of a half bushel, a bushel, and a bushel and a half of

grain. This experience was repeated over and over again thousands of times each year. I was also in the habit of counting the sacks as we stood them up against each other, until I became able to recognize with a fair degree of accuracy when there were in the pile twenty sacks, the number that made a load.

“When I was fifteen years old I was one of the strongest men about the place, and I was accordingly assigned the task of hauling in the grain. I used to lift the bags containing a bushel and a half each into the wagon-box, and when I arrived at the granary I lifted them to my shoulder, and running up a ladder some ten or twelve feet high, emptied them into a bin.

“In the winter season, when we marketed the grain, it was my task to tie the sacks, each of which contained something over two bushels, and to pile ten of these sacks on the scales and weigh them. I knew the weights and could call out the totals for ten sacks, which usually ran between twelve and thirteen hundred pounds. My brother entered these weights in his book, and I have a distinct remembrance of

the reverence with which I regarded his ability to discover from these weights the number of bushels and the number of pounds in each 'batch.' I used to long for the ability to work out this problem, but as I had forgotten my multiplication table and had forgotten how to do a sum in long division, it baffled me for a long time.

"Finally, I took to counting up the weight on my fingers. I knew that sixty pounds constituted one bushel of wheat and then as I counted on my fingers seventy, eighty, ninety, one hundred, one hundred and ten, one hundred and twenty, I found the weight of two bushels, and thus I kept on counting until I finally reached the weights which my scales recorded. Each bushel that I added in imagination was a real bushel, known to me through thousands of individual muscular efforts, and each two bushels formed a new unit which had just as vivid an abiding place in my sensile memory. But my answers, for all that, were always wrong. I went back over the process and counted up again and again, hundreds of times, and still

I was always wrong. Twelve hundred pounds would spell out twenty bushels, and twelve hundred and sixty pounds would as invariably divide itself up into twenty-one bushels, but my brother always found a different answer.

"It never occurred to me to ask any one for an explanation, and probably if I had asked I would have been put off with a smile; for I verily believe that any of the men around the place would have been heartily ashamed of himself had he been caught in the act of trying to explain a sum in arithmetic to the omadhaun. So the problem continued to baffle me for more than a year until I overheard my brother doing the sum out loud one day, and thus discovered that he subtracted ten pounds for sack weight. This was my first discovery in Pure Science, and the joy that it brought me was in no way diminished by my failure to recognize that it was the beginning of an intellectual development that would one day lift me into companionship with the learned.

"In the years that followed I tied and weighed a great many thousand bushels of

wheat, but never, I think, without mentally calculating the bushels and pounds, and the process was always the same, although I soon learned to dispense with the use of my fingers in counting and dealt wholly with sense images; but they were the sense images of real bushels of wheat and not of the artificial symbols on which children's minds are sometimes fed.

CHAPTER XII

The Development of Spatial Relationship

“The sense imagery that formed the basis of number in my mind was derived chiefly through the muscle sense. While the sense of touch and the sense of sight each contributed to the mental images of the various measures of wheat, there can be no question that the chief content of these images resulted from the constant repetition of muscular exertions. It is, perhaps, worth while to emphasize this fact. It is in ~~harmony~~ with some recent theories of mental development, and it is in entire accord with much of the work that is being done at present for the reclamation of the dullard. It is hardly necessary to add that while this was the foundation of the number concept in my mental development, it was not the only series of experiences that contributed to the growth and development of this side of my mind.

“During the summers between my tenth and

fourteenth years I helped to build several miles of board fence around our farm to replace the original rail fences that were falling into decay. In this way I learned to use the square and the hand-saw, and I made the close acquaintance of boards six inches wide and fourteen or sixteen feet long. The posts were not always placed accurately and so we were at times obliged to select boards that were either a little longer or a little shorter than the standard lengths. My eye was thus gradually trained to judge with considerable accuracy small variations in the lengths of the boards. During these years I was also frequently detailed to help the carpenters with the rougher work in building barns and out-houses, an occupation that taught me the use of the simpler carpenter tools and familiarized me with various lengths and dimensions.

“When I was about fifteen years old we hauled two or three car-loads of lumber from a siding a few miles from the farm to build a barn. I drove one of the teams and helped to load and unload the lumber. One day we load-

ed some green sills onto my wagon. Before the load had attained its usual size my brother remarked that I had eight hundred feet on, which, owing to the bad condition of the roads, he said, was quite enough for my team. I knew that the load was heavy enough for my team, but his remark that there were eight hundred feet of lumber on my wagon puzzled me sadly.

“At this time I could measure off a foot with my eye with great accuracy, and I had just as accurate an idea of what constituted a square foot, but, in my mind, neither of these things had anything to do with solids. I had frequently marked off a corn field into square yards and counted up the yards. I had often counted up the square feet of floor space in a bin or stall. But the cubic foot was my unit of measure for all solids. I was familiar with this cube in putting up ice and in measuring cord wood. I had no suspicion that the volume of a foot of lumber differed in any way from that of a foot of cord wood. I had hauled many a cord of wood and I knew its dimensions, eight

feet long, four feet wide, and four feet high, and I had frequently counted up the one hundred and twenty-eight feet which it contained. But this load of lumber, which to my eye did not seem much more than half as large as a cord of wood, contained, according to my brother's statement, *eight hundred feet*.

"I gave expression to my surprise, but my brother only repeated that there were eight hundred and sixty-four feet on the load. I puzzled over this all the way home. While I rested my team at the foot of a long hill, I went over the load carefully. It was one foot deep, three feet wide, and twenty-four feet long. I could not multiply these dimensions, of course, but I could measure off the blocks with my eye and count them up. As I went back over the load from side to side, marking off the square feet with my finger, I found that I had only seventy-two feet instead of the eight hundred and sixty-four feet of which my brother spoke.

"It was a clear case of conflict between evidence and authority, and, as usual, authority

had the best of it. My brother was to me an oracle on all matters, and I knew that he must be right whatever came of the evidence of my senses. But the problem stuck in my mind and teased me and I could not get rid of it. That evening at supper I mentioned the matter again to my brother. I told him that I had measured that load of lumber and that there were only seventy-two feet in it instead of eight hundred and sixty-four. He smiled his usual pitying smile that I remember so well. He doubtless considered my remark another proof of my hopeless idiocy.

“The matter did not rest here, however. I had very few things to think about in those days and that puzzle kept rattling about in my mind, teasing me. Every time I handled lumber I counted up the feet, and when I could get any one to measure the lumber for me and tell me how many feet there really were, I was confronted with the same old baffling contradiction. They all confirmed my brother’s statement and contradicted the tangible evidence of my senses.

"It never once occurred to me to question the accuracy of my idea of what constituted a foot of lumber, and those around me either failed to understand the nature of my difficulty or simply brushed it aside as one more of the omadhaun's vagaries, which it would have been worse than folly to seek to understand."

"Pardon me for interrupting you, Doctor," said Miss Russell, "but isn't that the reason why so many people are unable to help the children? The same words mean different things to the teacher and to the pupil, and they are constantly misunderstanding each other."

"Yes, that is precisely it, Miss Russell, and if the truth were known, many a dullard was made in this way. But at present the tendency is decidedly in the right direction. The teacher usually recognizes the folly of attempting to explain anything to a child until she herself has first learned to see it through his eyes. If she can comprehend his difficulty, it is an easy matter to remove it.

"But to return to my story, I have often said that I had no teacher to help me up out of the

darkness. This statement needs some modification. I had two brothers, Joe, ten years older than myself, and Bernard twelve, each of whom, without intending it, perhaps, performed for me some of the functions of a teacher. It would be difficult to find two men who, in their mental life, offered a more complete contrast to each other.

"Joe was a calm, decisive, imperturbable man; he was an omniverous reader; he was boss on the farm at the time of which I speak, and his orders were final and his decisions irrevocable. Joe dealt only in conclusions; his processes of reasoning and his data were all reserved for his own exclusive use.

"Bernard, on the contrary, was a mechanical genius, and while he had a fair education and was fond of reading, his mental life was built up largely of his own experiences. He was never content with assertions; he had to see things. If you differed from him, he proceeded at once to find out the reasons for the difference. With him there were twenty correct ways of doing everything, instead of one, and

it was only a question of choosing which of the twenty ways was the best.

"I need not add that the brother that I have referred to in both the wheat and the lumber incidents was Joe. Bernard was married at the time and lived on a farm of his own adjoining ours, and while we frequently worked together, I was in much less direct and frequent contact with him than I was with Joe.

"One day about a year after the incident of the load of lumber to which I have just referred I was helping Bernard put a roof on a barn. We ran short of sheeting lumber, and as Joe was just leaving for town, Bernard called down to him to bring home two hundred feet of it. I had noticed the shortage and had counted up the amount of lumber that would be needed, so I protested that seventeen feet, not two hundred, was all that would be required.

"Bernard asked me how I made that out. The unfinished strip of roof was seventeen feet long and twelve feet wide, so the problem was quite easy. I called Bernard's attention to the

fact that seventeen boards one foot wide and twelve feet long, each of which contained, according to my count, but one foot of lumber, would just finish the roof. Bernard asked me what I meant by saying that there was only one foot of lumber in each of the boards, and when I explained the matter to him, he said that I was thinking of a cubic foot and that a foot of lumber was only one inch deep. At last I had the solution of my problem.

"From this time forward the foot wide board became my standard of measurement. In imagination I saw it cut up into as many actual feet of lumber as the board contained. Fencing lumber presented no difficulty. These boards were all six inches wide, and by placing two of them side by side they were readily converted into boards a foot wide.

"The two by six dimension lumber was scarcely more difficult than the fencing lumber. I imagined each of these timbers split into two fence boards, and these placed side by side formed a one foot board. The six by six's were all first converted into two by six's. I spent

some weeks, while plowing or working in the fields, calculating the amount of lumber in every fence about the farm. But when I attempted to count up the amount of lumber in a barn, I soon struck a snag. In the barn there were numbers of two by four studding and two by four rafters and two by eight joists, and, at times, eight by eight sills. I could do nothing with any of these dimensions.

"I split the two by four's in imagination as I had the two by six's, but the two four-inch strips placed side by side measured only eight inches. They were too wide to be dealt with as fence boards and too narrow to be classed with the one foot boards. I split two of these scantlings in imagination and placed the four strips side by side; but they measured sixteen inches, and so the difficulty remained, and for a time it seemed hopeless.

"Had I actually split the scantlings instead of doing so in imagination only, I would probably have discovered that three of the four inch strips would make a board a foot wide. But as the case stood, it was some months before I

realized that by splitting three of the two by four's and placing the six resulting strips side by side, I could convert them into two one foot boards.

"After this, all difficulty in calculating the quantity of lumber rapidly disappeared. The four by four's, the two by eight's, and the eight by eight's were readily resolved into foot boards in the same manner as the two by four's. The ten inch wide material still presented some difficulty, but I soon hit upon the device of ripping off two inches of these timbers and putting the pieces together so as to make four inch or eight inch stuff. Sometimes I cut a two inch strip, in imagination, off a two by eight and added it to a two by four, thus converting the two pieces into two two by six's. Sometimes I converted in the same way three two by eight's into four two by six's.

"At that time I did not know the meaning of angle or triangle; I think I had not even heard the word geometry, and, as I have said before, I did not know the multiplication table. It would probably have been necessary for me

to resort to counting in order to add such large numbers as seven and nine; but I was solving many practical problems in plane and solid geometry, nevertheless, and the fever of investigation had taken a deep hold of me.

"The areas of irregular corners were yet to be calculated, and I resorted to various devices to reduce these corners to some regular shape that I could deal with. The sheeting of the gable ends of buildings compelled me to deal with triangles, although I am not aware that I used the term. I soon learned that in fitting a piece of board into the angle of the gable, there were two triangular pieces cut off which, if put together on their square edges, would just cover the same space.

"From this I soon learned that if I calculated every board on one gable as having the same length as the longest board, there would be enough lumber to cover two gables. Years afterward I learned that the scientific way of stating this simple truth is: the area of a triangle is equal to one half of the base into the altitude. Again, we usually nailed the jack-rafters to the

middle of the rafters, and they were always level. Of course, I afterward learned that the right way to state this is: a line dividing two sides of a triangle proportionally is parallel to the base."

"So you were really trained in the Speer method," said Miss Ruth.

"Yes, in a measure, I was, although the Speer block method was not developed until many years after the time of which I speak, and I had no more thought of educating myself by all this day-dreaming, as it seemed to me, than those around me had that I was being educated. My mind was simply growing and hungry. Having been thoroughly discouraged in every other direction, it grew along these lines, and rejoiced in its activity without even suspecting that it was growing.

"There are some obvious resemblances between the haphazard training that I received and the systematic training that children now receive in those schools that use the Speer blocks; but there are also many important points of difference to be noted. The work with the

blocks is systematic and the child gains as much, in some ways at least, in a month as I gained in years.

“But, on the other hand, every little bit of truth that the growing mind discovers for itself has more real value than many times the quantity if fed to it. There is a development of self-reliance and originality in discovery that is seldom attained in systematic instruction. Then, too, I made my own blocks and was compelled at a very early date to use imaginary ones.

“These memory pictures played a much larger role in my case than they do in the systematic training that is usually given in the schools where the children deal with actual blocks of all sizes and shapes. This fact is probably responsible for the power of constructive imagination which I formerly regarded as one of my best natural gifts, but which I have since come to believe was largely, if not wholly, due to the training of which I have just been speaking. I shall have occasion to return to this theme bye and bye; but there are

a few other lines of development that belong to this period which I think it better to consider first."

CHAPTER XIII

Contact With Nature

“A third line of development, closely related in many ways to the two that I have just outlined, but much more complex in character, finally brought me up out of the gloom and made me realize that at least in some things requiring brains I could succeed as well as others.

“At present, the Minnesota River meanders between narrow banks in a marshy bottom for some twenty miles before it is joined by the Mississippi. It's low banks are covered with fine old lindens and stately elms interspersed with occasional clusters of cottonwood and willow. The wild grape grows here in great profusion. Here and there it strangles a young sapling and converts it into a trellis. The more ambitious vines reach up and festoon the lofty arches formed by the branches of the linden and the elm. The wild plum, the sumac, and the hazel bush form a thickly tangled

mass wherever the tall trees permit sufficient light to enter.

"In past ages, here flowed a majestic river more than four miles wide, which, in the course of time, cut its way through some forty feet of limestone and more than one hundred feet of underlying soft white sandstone. The Mississippi emptied into the Minnesota at the head of this broad valley until a terminal moraine formed by the ancient glacier diverted its course into a new bed and caused it to plunge over a high precipice at the present point of junction. After this, the current of the Minnesota became very slow, and the accumulating sediment gradually confined the channel to its present course, leaving the remainder of the original river bottom covered by a shallow lake.

"As time went on, water lilies, bullrushes, wild rice, and weeds of various kinds choked up the greater part of the lake. Each year the melting snows and the spring rains caused the river to overflow its banks and to spread a layer of mud over the whole extent of the

ancient river bottom, which, with the decaying vegetation, formed successive layers of peat.

"This peat marsh is at present covered with moss and with luxuriant growths of blue-joint, red-top, vetch, and various wild grasses. Innumerable springs of clear, cold water bubble up through the peat from the underlying sandstone and wend their way to the open lake in little streams that gurgle and murmur between over-hanging mossy banks, sometimes lingering in the open sunshine, where they are filled with watercress, and again tumbling over some slight obstruction in mimic waterfalls, or hiding for a time beneath the peat. The tiger-lily, the iris, and the wild morning glory are everywhere in evidence.

"Each year, with the spring floods, multitudes of fish, coming up the river to cast their spawn, pass into the lake, where they are left imprisoned by the rapidly subsiding waters. In the tall reeds that still fringe the lake the summer breezes have rocked the nests of innumerable generations of red-winged blackbirds. Here, too, is the home of the meadow-lark,

the snipe, and the crane, of the wild duck and the loon. This meadow is the paradise of snails and frogs. Here the bumble bee finds immunity from the depredations of the field-mouse and may lay up his secure store of honey in each high tuft of moss. Here is the breeding place of the mosquito and the feeding ground of the dragon fly.

“Here in this world of beauty and of teeming life, the Julys of all my boyhood summers were spent in working with the haying crew. Here I gradually grew into a knowledge of many of nature’s processes and into sympathy with many of her moods. With no teacher but nature herself, I was made a daily witness of the many-sided struggle for existence going on about me, and the germ of many a natural truth, destined to grow and bear fruit in after years, found lodgment in my mind. Meanwhile, my mental life was being lifted into a new phase of development through the expenditure of my muscular energy.

“These meadow bottoms are too soft to permit of the use of horses or of machinery. All

the hay is cut with scythes and gathered up into cocks with pitchforks. Forty or fifty of these cocks are then carried on poles and built into a stack, in which the hay remains until the frosts of winter make it possible for the teams to approach."

CHAPTER XIV

Germinal Truths

"A large part of mechanics naturally grows out of a knowledge of the lever. And, during the haying season each year, the constant use of the hay-pole and pitchfork gave me a thorough knowledge of the lever."

"I hope you won't think me stupid," said Miss Russell, "but I don't see how you learned mechanics through the use of a pitchfork. I have no talent for physics and I had the hardest time to get a pass-mark in the subject when I was going through the high school; but if physics can be learned by the use of such simple instruments as a pitchfork and a hay-pole, there may still be some hope for me. Won't you please explain how you did it?"

"I shall be delighted to do so, Miss Russell; however, I must first protest that you do yourself great injustice when you say you have no talent for physics. From what I saw of your

work in the Lee School the other day, I am convinced that there is no subject in the curriculum for which you have not splendid talent. No, I am not complimenting, I mean just what I say. The teacher, in my opinion, is always to blame for the want of these special talents in the pupil, of which we so often hear.

“When we begin to teach mechanics with deductions from abstract principles, we are simply reversing the natural order of the mind’s growth. We should be quite correct were we to define a machine as a transformer of energy, and we might enter into an elaborate explanation of the meaning of such terms as *energy* and *transformation*. When we had finished, the pupils who had listened to us might think that they understood what a machine was, but their knowledge would be sterile.

“From Aristotle’s day down to modern times philosophers have busied themselves with elaborating theories concerning the nature of matter, and they doubtless believed themselves to be possessed of much profound knowledge of the subject; but, however correct their theories

may have been, it is well for us to remember that such theories have never yet led to practical results. Modern sciences and modern inventions have all grown out of actual contact with nature and not out of the speculations of philosophers.

“This, however, does not justify the abuse of the inductive method which is so frequently to be found in our modern schools. When our enthusiasm for the inductive method leads us to overwhelm our pupils with a multitude of details before they have obtained a general view of the subject, the usual result is an uncoordinated mass of facts, from which the pupils are unable to extract the great fundamental truths; and without these truths there can be little real progress toward the mastery of any science.

“Were we to take our pupils into a supply store and show them an endless variety of valves, wheels, and levers, they would be little better off, as far as a knowledge of mechanics is concerned, than if their minds had been fed on definitions and formulae. They would be

just as bewildered in the one case as in the other, when brought face to face with a set of complex machines in actual operation.

“To obtain satisfactory results in the teaching of any subject we should begin with germinal truths which contain the whole body of knowledge in somewhat the same manner as seeds contain fully developed plants.”

“Pardon me, Doctor,” said the Judge, “I am afraid I do not quite follow you. Did I not understand you to say a while ago that when we begin to teach mechanics by putting before the pupils a set of deductions from abstract principles, we are reversing the natural order of the mind’s growth? And now you tell us that to obtain satisfactory results in the teaching of any subject we should begin with germinal truths which contain the whole body of knowledge in somewhat the same manner as that in which seeds contain fully developed plants. Is not this tantamount to saying that to obtain satisfactory results we must reverse the natural order of the mind’s growth? Let me state my objection in form as we used to

do in the good old days when we were studying philosophy under Father Gherardo.

“To begin the teaching of any subject with abstract principles is to reverse the order of the mind’s growth. But germinal truths, which contain the whole body of knowledge after the manner in which seeds contain fully developed plants, are abstract principles. Therefore, to begin the teaching of any subject with germinal truths is to reverse the natural order of the mind’s growth, *quod absurdum est*.

“Or it may seem preferable to state my objection in positive form, thus: To obtain satisfactory results in the teaching of any subject we should begin with germinal truths which contain the whole body of knowledge to be imparted after the manner in which seeds contain fully developed plants. But such germinal truths are abstract principles. Therefore, to obtain satisfactory results in the teaching of any subject we should begin with abstract principles.”

“A hit! a palpable hit!” cried the Professor.

“I am afraid,” said the Doctor, “that I shall

have to polish up my armor before entering the lists against so redoubtable a champion. But if the Judge will consent I think it will not be difficult for us to settle our contention at the bar of modern pedagogy.

“In this objection it is taken for granted that a germinal truth is the same thing as an abstract principle, whereas I, whether justified or not, have used the terms to designate things that are separated by polar distances. An abstract principle presupposes a fully developed knowledge of the concrete from which it is an abstraction.

“The Greek philosopher, looking back upon a rich mental possession, abstracted the central thought. It is the terminal stage of a long series of mental processes, whereas a germinal truth is the initial stage and it leads gradually to the full development of the concrete. The germinal truth is in a sense rudimentary while the abstract principle is vestigial. They resemble each other from the standpoint of quantity; they are both diminutive; they both con-

tain the central thought and they are both equally sparing of details.

“The point of departure in our Lord’s teaching is always a germinal truth; whereas the Greek philosopher usually set out from an abstract principle. The Greek talked to the highly developed intellect. Christ spoke to little children as well as to philosophers. And He warned His followers that if they would understand His teaching, they must empty their minds of human traditions and of preconceived ideas and become as little children. ‘Unless you become as one of these, you cannot enter the kingdom of heaven.’ ”

CHAPTER XV

The Germinal Concept in Mechanics

“To begin the teaching of mechanics with the definition of a machine as a transformer of energy is a very different thing from beginning the study of the same subject in its concrete, germinal form, the lever. Young children, in playing with a see-saw, come to understand the meaning of the lever of equal and of unequal arms long before their minds are sufficiently developed to grasp the meaning of abstract definitions and mathematical formulae. They understand that a downward pressure on one arm of the lever is changed into an upward pressure on the other arm, and it does not take them long to discover that a child sitting out on one end of the see-saw will balance two or more children seated near the fulcrum on the other end. They understand, too, that the longer the arm, the larger the movement.

"In this way there is laid up in the minds of the children a secure foundation for the future study of the science of physics, since mechanics is the key to physics and a large part of mechanics is contained in the lever in somewhat the same manner as a fully developed plant is contained in a seed.

"It was not, however, from the see-saw that I learned mechanics. The hay-pole and the pitchfork are excellent means of developing in a boy's mind a clear knowledge of the lever and its functions. One hour in a hayfield would demonstrate this to your entire satisfaction, and if you will come with me in imagination to those Minnesota bottoms where I spent my boyhood, I think I shall be able to prove my point.

"The cocks of hay that we used to make weighed about one hundred pounds each. The meadow bottoms were soft and full of holes. The hay-poles were of light, well-seasoned poplar, about ten feet long. A pair of these poles was pushed under a cock of hay and the leader kept his back as close to the cock as possible

so as to give the man who followed some chance to pick his steps.

“In this arrangement the leader carried the heavier load. The men frequently changed places so as to even up the score. The pair of hay-poles thus constituted a simple, primitive pair of levers. They are the same in principle as the stretcher and the sedan chair, and were known to man before the dawn of history. They teach their lesson chiefly through the muscle sense, and from their earliest use man must have recognized the relationship existing between the relative lengths of the two arms of the lever and the relative distribution of the weight which the two men carried.

“The concept of the lever is developed much more fully by the use of the pitchfork. In the hay-pole the horizontal position is practically maintained, whereas in the pitchfork, the lever rotates through half a circle. Again, in the hay-pole the weight is always in the middle of the lever, whereas in the pitchfork, it is at one end and the power and fulcrum are one in each hand of the haymaker.

"If the right hand be held in the middle of the fork handle and the left hand at the extreme end, twice the weight of the hay is sustained by the right hand while a downward pressure equal to the weight of the hay is exerted by the left hand. Now, the relative positions of the hands on the fork handle are constantly shifting, and so the haymaker learns through his muscle sense the meaning of the varying lengths of the lever arms and the meaning of the relative positions of the lever as it moves round the axis of rotation.

"In the hay-pole, each hand is both power and fulcrum and the cock of hay is not quite clearly differentiated weight, since, in a sense, it is the axis of rotation and in so far it might be regarded as a fulcrum.

"Again, the position of the weight on the poles is not sharply defined. In the fork, on the contrary, the weight is always at one end and it is sharply differentiated from both power and fulcrum. Power and fulcrum, however, are not clearly differentiated, since either position may be made the center of rotation, and,

as a matter of fact, both positions are partially centers of rotation.

“It may thus be seen that there is a distinct development in the lever as we pass from the hay-pole to the pitchfork. The transition from the pitchfork to the pulley and to the wheel and axle is the next important phase in the development of the lever, but we shall have to defer its consideration until we meet again after the summer vacation.”

CHAPTER XVI

The Development of the Lever

"Dr. Studevan," said Mr. O'Brien, "we have deferred the reassembling of our little circle until you could be with us, as we wished to hear the completion of your story before taking up the discussion of any other subject. We left the boy in the meadows, you remember, acquiring a mastery of mechanics through exercise with hay-pole and pitchfork. We are anxious to learn of the circumstances which brought about his return to school."

"I'm sorry that my absence from the city has caused you to miss any of these delightful evenings. I was beginning to fear that on my return to Dunbarton Hall I should find you so immersed in other subjects that I wouldn't have an opportunity to tell you any of the creditable things about Studevan's omadhaun."

"Doctor, I've been puzzling my brain all

summer over a statement you made at our last meeting about generating a wheel from a lever," said Miss Russell. "Won't you please help me out of my difficulty before proceeding with your story?"

"I shall be very glad to do so, Miss Russell, particularly, as that bears on the next phase of mental development that I shall have to describe. But I regret that so long a time has intervened since our last discussion of the simple forms of the lever. A few words then would have sufficed to remove your difficulty. Let me refresh your memory by restating, in as few words as possible, what I said on that occasion about the lever and its functions.

"The lever is the simplest of machines. It may affect energy in any one of four ways: it may shift the point of application; it may reverse the direction; it may increase the intensity, acting through a diminished distance; it may diminish the intensity, acting through an increased distance.

"Now, let us apply this to the problem of generating a wheel from a lever. Here is a

wheel from a toy wagon from which I shall remove the rim, leaving the four spokes in position. These four spokes constitute two levers having a common fulcrum in my pencil, which I shall use as an axle. Let us consider first this pair of spokes that are now in a horizontal position. They constitute a lever of equal arms, having a fulcrum at the center. An ounce weight at one end of this lever will balance an equal weight at the other end, and the wheel will consequently remain at rest.

“Were we now to increase one of these weights, the wheel would rotate until the heavier weight assumed a position at the bottom where it would come to rest, with the lever in a vertical position. The other lever is now in a horizontal position, and if the weights were to be shifted to the ends of this lever, the motion would be repeated. In practice, this would prove inconvenient, and, moreover, the lever does perfect work only while it remains in a horizontal position. As it departs from the horizontal position, its functions, when acting against gravity, gradually diminish un-

til they finally reach zero when the lever attains a vertical position.

“These two defects of our present apparatus may be remedied by replacing the rim on the wheel, or by choosing a solid wheel instead. A horizontal section through this wheel may still be considered a lever of equal arms with its fulcrum at the center. If instead of fastening our weights to the wheel at the points corresponding to the ends of this lever, we fasten them to the ends of a long cord and pass the cord over the wheel, we shall have a pulley.

“If the weights on the ends of the cord be equal, the pulley will remain at rest. If one weight be heavier than the other, it will descend, causing the wheel to rotate, until it reaches some support or until the other weight reaches the wheel. All the while these two weights continue to act on a horizontal lever, consisting of a section of the wheel passing through the fulcrum and the points where the cord leaves the wheel.

“While we are dealing with this matter it may be as well to mention one or two other

points about machines that will serve to throw light upon the phase of mental development which I shall presently try to explain. The functions of the lever which we have just considered are the shifting of the point of application of the energy and the reversing of its direction.

“The intensifying of the energy or the increasing of the distance through which it acts, is secured by the use of the lever of unequal arms, or by the form of lever that has its fulcrum at one end.

“If we support one end of a lever and hang a weight of two ounces to its center, there will be a downward pressure of one ounce exerted on its free end. If we lift the free end through two inches, the center will be lifted but one inch. Here we have a power of one ounce lifting a weight of two ounces through one-half the distance which the one ounce of power moves.

“It is evident that this same function might be performed by the pulley. If we fasten one end of the cord which passes over the pulley

and attach one ounce to the other end, this one ounce will exert a downward pressure of two ounces on the pulley, and if the pulley be free to move, it will descend only one-half the distance through which the weight at the free end of the cord moves. There is here a fixed ratio between power and weight and this ratio is inversely as the distances through which they move. The one is always just one-half of the other. If we wish to increase this ratio, we must increase the number of our pulleys.

“We might, however, increase the ratio of power to weight by using a lever of unequal arms. If we support one end of a lever four inches long, and attach a weight of six ounces one inch from the point of support, the weight will exert a downward pressure of only one ounce at the free end of the lever. If we have a lever four inches long with the fulcrum one inch from the end, a weight of one ounce at the end of the long arm will balance a weight of three ounces at the end of the short arm.

“If we rotate a lever of this sort around its fulcrum, its ends will describe two concentric

circles, the radii of which are to each other as the respective lengths of the lever arms. If, now, two pulleys corresponding in size to the concentric circles be fastened together and made to rotate on a common axis, a weight of one ounce fastened to the cord which unwinds from the larger wheel will lift a weight of three ounces fastened to a cord which winds on the smaller wheel. We have here what is known in mechanics as the wheel and axle; through its use the ratio of power to weight may be varied within wide limits.

“It will not be necessary for me to impose upon your patience by asking you to listen to further explanations of the elements of mechanics, or to the way in which they may be mastered even by the dullest of pupils, since the simple farm machinery that was familiar to my boyhood consisted for the most part of the lever, the pulley, and the wheel and axle combined in various ways and modified at times in the form of the eccentric and the crank-shaft.”

CHAPTER XVII

Sense Experience and Literature

“While Minnesota was still a part of the great north-west territory, there was dug on our farm a well, six by six and eighty-five feet deep. This was curbed with dressed sandstone, which left a round open well that yielded an inexhaustible supply of delicious spring water, which soon earned for it an enviable reputation, even in that land of lakes.

“A lattice with a projecting roof covered the well. A pulley such as I have just described was suspended from the center of the roof. Ninety feet of inch rope passing over this pulley with a pair of ‘old oaken, iron-bound, moss-covered buckets’ attached to the ends of it by means of a few feet of chain completed the apparatus for drawing water.

“During my boyhood days the pump and windmill replaced the open well on the surrounding farms, but up to the day we left the

old farm sentiment kept the old oaken bucket hanging in our well, and nowhere else has water ever tasted so sweet to me as from its battered rim.

“On opposite sides of the enclosing lattice-work two doors opened down to within three feet of the surrounding platform. I do not remember when I first drew water from the old well, but I have a vivid recollection of pulling on the wet rope when I was scarcely tall enough to reach it, and I remember, too, how tired I used to be before the seemingly endless rope finally brought the bucket to view. It frequently happened that my sister helped me, one of us pulling down on the rope at one side of the well, while the other pulled up on the rope at the other side.

“Looking back from this distance, I remember that we had a clear realization of the fact that the bucket was heaviest at the bottom of the well, but we attributed this to the great depth of the well without suspecting that the weight of ninety feet of wet rope was added to the weight of the bucket of water at the

beginning of its upward journey; and that this same heavy rope acted as a counterpoise as the bucket neared the surface. We fully realized the fact that it was much easier to pull down on the rope than to pull up on it, although I am very sure that neither of us suspected that this might be in any way connected with the habits of our remote ancestors.

“Thus through their senses and their muscles children come to a realization of many truths in their concrete setting without troubling themselves to seek out the hidden springs of the results which most deeply interest them. Truth grows in their minds from germs of this sort and the full beauty and flower appear much later.

“None of us could have written ‘The Old Oaken Bucket,’ but our experience with this well gave a depth and a meaning to the words of the poem quite unattainable by one whose childhood knew no similar experience. And few things call up more vivid recollections of my boyhood than the lines:

'How dear to this heart are the scenes of my
childhood,

When fond recollection presents them to
view!

The orchard, the meadow, the deep-tangled
wildwood,

And every loved spot which my infancy
knew;

The wide-spreading pond, the mill which stood
by it,

The bridge, and the rock where the cataract
fell;

The cot of my father, the dairy-house nigh it,
And e'en the rude bucket which hung in the
well!

The old oaken bucket, the iron-bound bucket,
The moss-covered bucket, which hung in the
well.

'That moss-covered vessel I hail as a treasure;
For often, at noon, when returned from the
field,

I found it the source of an exquisite pleasure,
The purest and sweetest that nature can yield.

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How ardent I seized it, with hands that were
glowing;

And quick to the white pebbled bottom it fell;
Then soon, with the emblem of truth overflowing,

And dripping with coolness, it rose from the
well:

The old oaken bucket, the iron-bound bucket,
The moss-covered bucket that hung in the well.

'How sweet from the green mossy brim to receive it,

As poised on the curb it inclined to my lips!
Not a full blushing goblet could tempt me to
leave it,

Though filled with the nectar that Jupiter
sips.

And now, far removed from the loved situation,

The tear of regret will intrusively swell,
As fancy reverts to my father's plantation,
And sighs for the bucket which hangs in the
well;

The old oaken bucket, the iron-bound bucket,

The moss-covered bucket, which hangs in the well.'

"Our early sense experiences, after all, determine, in large measure, the meaning which literature holds for us in after life."

"That is true, Doctor," said Miss Ruth, "and any schoolroom may furnish pathetic instances of the meager content the child finds in even simple word pictures when he lacks the sense experience required to invest the picture with life and meaning. How little a child may get from this very poem that is so full of beauty and feeling for you, was illustrated the other day in a fourth grade room that I was visiting.

"The class was studying the Old Oaken Bucket, and the children were told to illustrate with their crayons what the poem meant to them. One dear little girl, who had spent all of her ten years in a city and who had evidently never seen an open well, brought me her paper on which were sketched three wooden pails that differed from each other chiefly in color effects. The first was plain brown, the

second had a series of black bands around it, and the third was covered in places with green fuzz. Towards the bottom of the paper there were a number of irregular color patches. When I asked her why she had three buckets, there was not a little of the child's pity for the ignorance of grown-ups in her ready answer, that one was the old oaken bucket, the next was the iron-bound bucket, and the third was the moss-covered bucket. And, when I sought enlightenment on the meaning of the color patches, she looked up at me and replied, with a tone of triumph in her voice, 'they are all the loved spots which my infancy knew.' "

"Woodworth's poem must be responsible for similar experiences in many a schoolroom," said Professor Shannon. "Ten years ago I heard Miss Eliza Haley of Chicago tell of these 'loved spots,' and Professor O'Shea has a similar story in his *Dynamic Factors of Education*."

"If I am not anticipating your story, Doctor," said the Judge, "I should like to ask whether you trace to literature like the 'Old

Oaken Bucket' the beginning of your taste for books?"

"No, literature of that order appeals only to the mature. The actual experience of childhood and youth, such as that of drawing water from the old well, bear their rich fruit in later life. The child, the savage, and the undeveloped generally, crave action and a play of the imagination. Fairy tales, detective stories, and the idealistic novel appeal to them rather than fine descriptions of familiar scenes and events. The mature find much of their enjoyment in the past; the immature live in the indefinite future. The immature appreciate only action and large outlines; the mature delight in subtle undercurrents, in the play of motives, and in accuracy of detail."

CHAPTER XVIII

A Ray of Hope

"At the time of which I speak, I was sunk in such deep discouragement that I question whether any form of literature could have reached me. There was nothing in the past that interested me, and my horizon extended but little beyond my father's farm. I was wholly absorbed by the various employments in which I was engaged. Some measure of self-reliance, some little confidence in my own mental powers, was my one great need at that time, and this I finally attained through the mastery of the simple machinery with which I worked.

*best opinion, interpretation
or experience of others.*

"So long as we use a machine in the form in which it is given to us and for the attainment of only those ends which were contemplated by its builder, the machine remains our master. Our mastery over the machine dates

from the moment in which we learn to modify it and to adapt it to our purposes.

“If I were lecturing on pedagogy instead of telling you how I came up out of the darkness, I would emphasize the fact that we have here reached a principle of universal application. It is as true of methods as it is of machines; as long as we accept any method literally and carry it out in all its details as it is set forth by an authority, the method remains our master. Our control over the method dates from the time when we learn to modify it and to adjust it to each present situation.

“But to return to my story. My early familiarity with simple machinery laid the sure foundations of my subsequent knowledge of mechanics; but it had another result of much greater value to me. My attempts to modify a few of the simple farm machines, produced in me the first discernible germ of self-reliance, the dawn of faith in my own mental powers.

“The first instance of this kind that I can

recall occurred in my thirteenth year. In the morning, while the dew prevented us from gathering up the cured hay, it was my usual task to turn the grindstone on which the mowers sharpened their scythes. Now, a new grindstone has a large diameter, and a low speed of the crank suffices; but as the stone wears down to a small core, a progressive increase in speed is required for the attainment of satisfactory results, and this increase of speed adds considerably to a task which at best is tiresome.

“One morning towards the close of the haying season, when the stone was worn down to a small core, and the mowers were in a hurry, my patience reached its limit. The urgent haste and my tired muscles both cried out for a remedy, and the first suggestion of this remedy came to me from previous muscular exertions, which have, throughout all human progress, been the prolific source of inventions.

“A device was needed that would cause the grindstone to revolve faster than the crank. I remembered that this end was actually at-

tained in a fanning mill that I had spent many a long day in turning. The handle of the mill was attached to a large cogwheel, each revolution of which caused a small pinion attached to the shaft of the fan to revolve several times. I there and then resolved to transfer the wheel and pinion from the discarded fanning mill to the grindstone.

“When, some days later, I attempted to carry out this resolution, I failed completely; and my failure brought down upon my head the ridicule that greeted all my attempts to depart from the trodden paths. But there was a noteworthy difference in my mental attitude on this occasion from that which followed former failures. In this instance I had obtained a clear view of a mechanical truth that neither failure nor ridicule could obscure.

“I did not realize all the elements in my failure. It seemed to me to be wholly due to my lack of mechanical skill in carrying out my idea, and indeed this was the chief cause of my failure. The bearings on which the axle of the grindstone turned were of such a nature

that they would not hold the shaft in position in the new arrangement. As soon as I attempted to turn the grindstone, the pinion slipped away from the larger wheel, and, at that time, I had not sufficient ingenuity to devise a method that would hold the shaft of the grindstone at the requisite distance from the shaft of the larger wheel.

“Had there been a mechanic present, he might have pointed out another source of failure that would have remained, even had I succeeded in remedying the defect of which I was conscious. The large wheel was fully ten times as large as the small one, consequently the stone would have to turn ten rounds to each round of the crank, which is too high a speed for the power available in a boy’s arm.

“It was fortunate for me that no one pointed out the various shortcomings in my device, for that would probably have discouraged me from further attempts in the same direction. As it was, I could see only one cause of failure, and my mind busied itself with seeking a remedy for this.

"There was another grindstone on the farm, an heirloom of territorial days, which was used only for rough work, such as grinding grub-hoes and axes. It had been hewn from a large block of sandstone at the time the masons were curbing the well. It weighed several hundred pounds. The shaft was made in a forge and it turned in metal boxes. I transferred the wheel and pinion to this grindstone and succeeded, with strenuous efforts, in causing the grindstone to revolve at a very high speed, but of course the least pressure on the stone acted as a brake and rendered it impossible for me to keep it in motion. Besides, the rapid rotation soon shook the old wooden frame to pieces.

"It was another failure, but the failure was not complete. I had actually accomplished what I set out to do, that is, I had made the grindstone turn, and turn rapidly, and I believed that the failure to secure permanent results was due, in large measure, to the great weight of the grindstone; besides, I had incidentally come upon the play of inertia and the

function of a balance wheel in mechanics. Nevertheless, this second failure and the ridicule that accompanied it made me pause, and more than two years elapsed before my next attempt to become an inventor."

CHAPTER XIX

Judicious Praise

"Doctor, didn't your efforts to improve the grindstone make your people realize that there were better things in store for you?" asked Mrs. O'Brien.

"No, I am afraid not. Of course it is easy enough for us now, in the light of subsequent developments, to recognize in these first crude attempts the awakening of my mind; but to those around me then, who had settled convictions of long standing concerning the limitations of my intelligence, it could scarcely have seemed a creditable achievement merely to shake to pieces the frame of the old grindstone without obtaining any practical results.

"A word of praise at that time or an appreciation, however slight, of the thought I was endeavoring to work out would have been grateful to me and it would probably have

hastened my development along mechanical lines. But, after all, I question whether it was not better as it was. Premature praise often proves mischievous, particularly when it tends to produce a forced growth. I feel sure that it was fortunate for me that the seeds of mechanical truths planted in my mind by these early experiments, were allowed to germinate there undisturbed. As it turned out, they grew and bore abundant fruit in due season."

"Don't you believe in praising children for their partial successes, Doctor?" asked Miss Russell. "I have often heard you say that you are opposed to premiums and to punishments for children; and if you refuse the teacher the privilege of praising them, what incentive has she to offer to induce them to study?"

"I do believe in praise, Miss Russell, but I do not believe in *premature* or *injudicious* praise. It requires no mean skill and the greatest care on the part of the teacher to mete out due praise to the children for worthy achievements without thereby lifting praise into a motive for their future actions, which would be fatal to their best interests.

“The best development of mind and heart can be attained only when external motives are reduced to a minimum or when they are excluded altogether. There is no real progress in intellectual life until the delight in the discovery of truth becomes the controlling motive; just as there is no real goodness until conduct is governed by love of God and fellow-man. Is not this what our Saviour meant when He said, ‘Do ye good, therefore, hoping for nothing thereby, and your reward shall be very great’?

“The injudicious praise I had in mind just now inflicts an injury of a different sort on the growing mind. By praising the child for his success along some one line we are liable thereby to concentrate all his efforts in that direction. Now, an early concentration of effort in one direction results in too narrow a basis for good mental development, even in the chosen branch. Where this occurs the mature mind will be found lacking in balance and symmetry. The man may become a specialist, but he will have all the narrowness and the lack of insight into the broader affairs of life that

so frequently characterize the technical expert."

"It would be interesting to know what praise you do believe in," said the Professor, "since praising children for their successes results, according to your theories, in making praise the motive of their subsequent endeavors, and this you say would exclude them from the higher realms of life. And, on the other hand, by praising children for success along some one line we are liable to destroy balance in their development and to produce narrow minded cranks."

"I have already said, Professor, that I regard it as one of the teacher's most difficult tasks to mete out judicious praise to the children for whose mental and moral development she is responsible. In my remarks just now I intended to indicate the two ways in which the unskilled teacher is most likely to fail in the performance of her duty. It is, indeed, no easy matter to so praise a child as to increase his joy in the achievement itself, yet it is not impossible. But praise too frequently results

in turning the child away from his ideal of perfection in the chosen field and in making him seek the teacher's commendation instead. Such praise transforms the child of the kingdom into the hireling.

"Again, it is one of the teacher's chief duties to preserve balance in the child's developmental tendencies. But when she praises him for successes in the lines in which his talents are most pronounced she is exaggerating his asymmetry instead of correcting it. The teacher should constantly endeavor to awaken the child's interest and to stimulate his efforts in those directions in which he exhibits the least natural tendency to develop. Judicious praise is here an invaluable aid in restoring and preserving balance in the child's mental development. I am convinced that we seldom praise a child for his efforts along the line of his chief talent without thereby injuring him.

"Had my attempts to improve the grindstone met with appreciation and applause, I might have become a mechanic, but all the wider development that actually came to me in

after years would have been excluded. I was then living in a state of chronic discouragement and, had my crude attempts at invention brought me the praise for which my whole being hungered, all my energy would have been directed into this one narrow channel, and other elements that were quite essential for the full development of even my mechanical power would have been omitted.

“As it was, I was more keenly conscious of failure than I was of success. Indeed, the only success that appeared to me was a rather hazy figure in the background; I had gained an abiding conviction, in spite of the immediate failures, that my plans would work if properly carried out. Nevertheless, the failures were the things I most keenly felt, and they served to check for a time the tendency to develop in this direction.

“During the two years that followed my mind was chiefly occupied with the development of the number concept in connection with the sacking and hauling of grain and with the development of spatial relationships

in the measurement of lumber. I have already given you an account of these developmental phases. These three lines of development, overlapped and blended in many ways, formed the basis of my subsequent mental life."

CHAPTER XX

The Dance of the Moonbeams

"The year 1878 was a memorable one in my life. It was during this year that the first ray of hope penetrated the gloom of discouragement in which I lived. As a matter of fact, my mind had been steadily growing during the two or three preceding years, but the manifestations of this growth were such as to escape recognition by those interested in me; and nothing would have surprised me more at the time than to be told that my mind was awakening and giving promise of a development that would one day make me the equal of the farm lads of the neighborhood. Indeed, I believe there was no time during the seven years that had gone before in which I had a more poignant conviction of my mental incapacity than during the few months preceding the completion of my sixteenth year. This was probably due to the fact that my awakening

mind was beginning to compare my own condition, or the estimate in which I was held by others, with the positions of those around me, who were credited with the possession of normal faculties.

"It was during this year also that my taste for reading was awakened; but this line of development proceeded slowly and had no part in my first mental successes which were clearly traceable to a nucleus of growth organized out of experiences derived through my muscles and sense of touch.

"My mind, hemmed in by the narrow horizon of one debarred from the realm of letters, busied itself in combining and re-combining memory pictures that had been gained through these fundamental senses; and thus there was laid the foundation of a constructive imagination which I still number among my most valued mental possessions."

"But, Doctor, were you not endeavoring to spell out some puzzle, or to work out some mechanical scheme?" asked Miss Ruth. "You surely do not mean that the mere aimless play

of imagination, day-dreaming, leads to valuable results!"

"Day-dreaming played an important part in rescuing me from dullarddom, but I would be very sorry, merely on this account, to give unqualified endorsement to every day-dreamer. There is day-dreaming and day-dreaming, you know. The wise man in his silence has often been likened to the fool, but the likeness is superficial. The one is silent because he deems it unwise to express his thought; the other is silent because he has no thought to express.

"The lax muscles and the vacant stare of the dawdler should not be accepted as *prima facie* evidence of day-dreaming, or, if so, we are in need of some other term to designate that condition of mind, so characteristic of the frontiers of thought, in which the attention is wholly absorbed by the play of eager elements of mental growth and in which mere sentient phenomena are transfigured by the light of truth.

"The consideration of day-dreams of this sort brings me back to an August evening spent on the Mississippi river some years ago. I

was leaning over the rail on the deck of the City of Dubuque watching the wave that was being molded by the prow of the boat on the smooth surface of the river. As this wave receded obliquely toward the neighboring bank it stole a broad band of silver from the full harvest moon and bent it to its form in Hogarth's line of beauty. This band lengthened and shortened, softened and accentuated its curves from moment to moment, as the boat, veering in its course, presented the wave to the moonbeam in a constantly changing angle. As I looked back from this unbroken band of silver light to a bend in the river a mile distant, I was captivated by a veritable dance of the sprites. The waves formed by the prow of the boat, impinging upon the uneven banks, were reflected at widely divergent angles; they crossed and recrossed, breaking up into a thousand rounded fragments, each of which caught a moonbeam and whirled with it in an elfin dance of exquisite beauty."

"The parable, Doctor, give us the parable," said Professor Shannon. "I had counted on

being at home before this time, but of course I never would be forgiven if I left without the moral that is to adorn your tale."

"Patience, Professor, or if you feel that you must leave us, I will promise you a ready pardon. But the parable is this: the unbroken waves formed by the prow of the boat are the primary mental pictures born of the contact of mind with matter through the channels of sense. The curved bands of moonlight imprisoned in the receding waves are the glimpses of truth from beyond the realm of matter that reach the mind through these pictures. The length of the imprisoned band of moonlight and the sharpness or softness of its curves depend on the angle of vision even as divergent points of view give varied meanings to similar sense experiences.

"Now, the elfin dance of the waves and the moonbeams is the day-dream that has ever preceded the exact formulation of human knowledge. The play of fecund memory pictures, born of the embrace of mind and matter, has ever been man's inspiration in the con-

quest of truth. In this apparently aimless play of combining memory pictures the mind catches glimpses of beauty and hints of unrevealed truths that rouse the whole man to the eager and persistent effort in pursuit that has ever marked the artist and the discoverer in the fields of pure science."

CHAPTER XXI

A Day-Dream

"Doctor," said Miss Ruth, "I am sure we all feel grateful to you for the beautiful illustration of day-dreaming you gave us last Friday evening, so I cannot regret having asked the question that I did; but don't forget, please, that we are anxiously waiting for you to tell us how day-dreaming helped you to come up out of the gloom."

"No, I have not forgotten, Miss Ruth; I had, in reality, intended to tell you that story the other evening, but Professor Shannon got frightened at the moonbeams and broke up the meeting.

"The day-dream is seldom articulate enough to issue in language; it is thought in embryo, and it should see the light of day in action before being clothed in words. Its soft outlines rapidly fade from memory unless they become shapely defined in some concrete embodiment.

"In the summer of 1878 I had a day-dream that issued almost immediately in practical results of the greatest importance to me. In this circumstance may be found the explanation of the fact that even the smallest details of that day-dream are still clearly and indelibly stamped upon my memory.

"It was early June, my brother and I were hauling timothy hay to market. For eight miles our road wound along the margin of the high bluff on the right bank of the Mississippi. My team—Jenny, a large dun-colored mule that had been dismissed by the government ten years previously on account of old age and rheumatic joints, and Lame Jack, a big bay draft horse that had acquired a stiff leg and a swollen knee during one of his many winter campaigns in the northern pineries—followed slowly along behind my brother's load, from which they munched contentedly.

"Do you ever in your dreams obtain a point of vantage from which you view yourself and study your emotions and your actions as if they belonged to some one else, preserving all the

while that curious double consciousness that makes you at once the observed and the observer? If so, you will readily understand my difficulty in choosing between the first and the third person whenever I speak of the lad as he sat on the load of hay that bright June morning.

“He has just completed his sixteenth year, but his five feet, ten inches make him look much older. His one hundred and sixty-five pounds are so well disposed in his strongly built frame that there is no appearance of superfluous flesh. Looking at him in his loose, well-worn brown jeans, as he sits tailor fashion on the load of hay, his head sunk between his shoulders and his muscles lax, you will be likely to underestimate both his height and his weight. The dreamy brown eyes are overshadowed by luxuriant auburn brows; a broad forehead is partially revealed beneath the brim of a battered straw hat; the nose is large and strong, but the lower part of the face gives an impression of weakness. This impression, however, is not due to the chin which is in reality large and

strong, but to the lack of muscle tonus which causes the mouth to hang open habitually and the lower lip to protrude.

“As the team reaches the top of Pilot Knob, an elevation of some five hundred feet above the river, the view which greets the eye of the beholder is one of surpassing beauty. On every side well tilled fields, big with the promise of the coming harvest, stretch away over the undulating ground to the encircling horizon. Beneath, on the opposite side of the river, St. Paul lies spread out over a group of low hills; to the northwest the spires and chimneys of Minneapolis stand out against the blue of the summer sky; to the left you look down into the broad expanse of the Minnesota valley where for thirty miles the eye follows the river as it meanders between its wooded banks. In the foreground, two hundred feet beneath you, Fort Snelling crowns the high promontory that marks the spot from which in ages past the Mississippi leapt over the precipice into the bed of the Minnesota three hundred feet below. Here the two mighty rivers still em-

brace for a brief moment before separating, to meet again below the large and densely wooded island formed from the rock and sand dug out of the ancient river bed by the Falls of St. Anthony, and blend in a union that shall know no further parting.

“But the magnificent lines of the landscape and the delicate tints of the wild rose by the wayside are equally lost on this boy who sits dreaming on the top of his load of timothy in the June sunshine. He is enveloped in a mental atmosphere that is alike impervious to the joyous song of the bob-o-link in his hedge of hazel and briar, and to the lazy drone of the bee returning to his hive, laden with the spoils of the clover field.

“Out of the rich and fecund sense experience gained through muscle and sense of touch in the plowing and in the seeding, in the meadow and in the harvest field, he is building a mental world of his own, crude and undeveloped if you will, but filled with the vigor of unmolested natural growth.

“You may revisit the scene at will. Pilot

Knob still looks down upon it from his commanding height. On a bright June morning you may still hear the breezes playing a slow wedding march in the surrounding hills, while the Minnesota river, like a fair young bride, lingers in many a winding curve and with many a backward glance to her peaceful valley home, kissing the weeping willows and murmuring farewells to the rushes, leaning caressingly on her sheltering banks, as she moves forward with sweet reluctance to join the impetuous bridegroom coming to meet her, leaping in the cataract and foaming with impatience in the rapids.

“The Twin Cities have grown apace; but the contour of the landscape remains practically unchanged through the lapsing years. But of the inner world in which the boy lived, moved, and had his being on that other June morning twenty years ago, there is no record save that inscribed on the tablets of my memory.”

CHAPTER XXII

A New Problem

"I have repeatedly scrutinized each circumstance and event of that spring in the hope of discovering the immediate antecedents of my day-dream, but always with the same negative result. I have ceased to be surprised at this. The thought has grown upon me that we should look to a more remote past for the stuff of which our dreams are made, even as we go back through the long, bleak months of winter to find the source of the color and fragrance of the apple blossoms in the garnered sunbeams of the previous summer.

"In those days each farmer swore by his own reaper and discussed its points of superiority at the crossroads, in the market place, or around the church doors of a Sunday morning. My brothers were loyal to Wood's Chain-Rake Reaper. No other machine was so light running; no other dropped so neat a bundle. The

agents of the McCormick or the Champion had soon discovered that it was useless to talk their wares at our place.

“In my eyes Wood’s Chain-Rake Reaper was the embodiment of mechanical perfection. It had not occurred to me that by taking thought I might add one cubit to its stature. In fact an attempt on my part to improve this Paragon of Perfection would have seemed to me presumption so colossal as to render me a fit subject for the insane asylum. And yet, on that morning my mind was obsessed by Wood’s Chain-Rake Reaper.

“From the time I was a child of seven until my weight became too great to be added to the horse’s load, it was my task during each harvest to drive the pair of leaders on my brother’s reaper. I rode bareback on the nigh horse, and every time the reaper broke down, and it broke down pretty often in those days, I jumped from the horse’s back and helped Bernard to make repairs. Sometimes I held the sickle-bar while he riveted on a new section, or again I helped him to replace a broken

link in the rake-chain; at times it was even necessary for me to crawl under the machine and lie on my back on the ground so as to hold a bolt firmly with a big monkey wrench while he unscrewed its stubborn nut.

“My ear soon came to recognize unerringly the sound of a loose nut or of a broken sickle section. Every wheel and journal, every bolt and screw of the machine reached my consciousness through ear and eye, through muscle and sense of touch. In fact, during my childhood, Wood’s Chain-Rake Reaper laid hold of all my senses and filled my imagination. To me it was the symbol of harvest. It was the heart of those few bustling, anxious days on which the fruitage of the whole year’s toil depended, and it naturally became the center of my conscious life during the silent years that followed, assimilating the elements of mental life derived through all other forms of sense experience.

“The discouragement resulting from my failures to improve upon the grindstone prevented me from seeking to embody in concrete

form the mental life that from day to day was growing in vigor and that finally held my imagination captive in the day-dream.

“The habit of day-dreaming into which I had fallen during my sixteenth year did not at the time seem to me to have any value. I was not seeking to invent anything, nor did it ever occur to me to attribute to the habit an educative value. Whenever present circumstances ceased to hold my attention I simply could not keep my imagination from playing with the various parts of the machines with which I had grown familiar.

“On the morning of which I speak, I had practically nothing to do during the two hours occupied by our trip to town. I simply sat idle in the sunshine on the top of my load of timothy and let my horses follow my brother’s load. I did not need to touch a line until we reached the crowded city streets.

“It is not easy, however, to trace the immediate source of my dream on that occasion. Several weeks of sunshine and of shower must intervene before the green fields of early June

will be converted into the golden harvest. Nor have I ever been able to discover any reason why Wood's Chain-Rake Reaper should have dominated my day-dream on that particular morning; the reapers had not been touched since they had been dismantled and backed into their places in the machine shed after delivering to the tired binders the last sheaves of the preceding harvest.

"But I remember distinctly that, as we reached the top of Pilot Knob, my imagination was occupied in following the motion of the drive wheel through the train of wheels and spur gearing to the sprocket wheel that drove the rake. My imagination held each wheel revolving in its place and traced each reversal of motion in the gearing until it finally rested satisfied in the picture of the rake traveling round the platform and always in the right direction.

"Having exhausted this material, my imagination busied itself for a time in picturing the relative velocities of the several rotating wheels. I found this task more difficult and the results

less satisfactory. The sizes of the wheels were such as to involve the use of fractions; so, after a short time, I turned my attention to another part of the machine and confined my efforts to an attempt to picture the number of times the sickle moved to and fro to each revolution of the drive wheel.

“As I did not know how to multiply or divide, I found no little difficulty in working out this problem. The pinion which meshed with the drive wheel was about one-eighth of its size. I imagined the circumference of the little wheel spread out and applied to the rim of the larger wheel, and thus easily reached the conclusion that the smaller wheel revolved eight times to each revolution of the larger one. Keyed to the shaft of the smaller wheel there was a large bevel gear which turned a pinion about one-ninth of its own size. The axle of this pinion terminated in a crank shaft which drove the sickle. I readily pictured the movement of each of these parts of the machine, but my inability to multiply nine by eight prevented me from discovering the number of times the crank

shaft revolved to each revolution of the drive wheel.

“Baffled here, I began at the other end of the problem. I saw in imagination each revolution of the crank shaft and counted the revolutions until they resulted in one complete revolution of the bevel gear. Then I continued this process, while with the other mental eye, as it were, I watched the small gear creep slowly around the circumference of the drive wheel, until I was able to picture in imagination the one hundred and forty-four strokes of the sickle that corresponded to a single revolution of the drive wheel.

“The number was, of course, only an approximation, and in this respect there was still lacking something which could be supplied only by actual measurement or by actual counting of the teeth in the four wheels involved. But this did not prevent the element of success in my endeavor from diffusing through my mind a glow of satisfaction which lifted it for a brief moment to a higher plane, where it

found in an incident of the previous harvest a new problem.

"I had been binding, and had stepped aside to let the reaper pass. The grade was steep and the horses were drawing the reaper down the hill at full speed, when a little dry twig caught in the sickle and locked the whole machine. The drive wheel dug into the soft earth and the heavy pole team broke their double-tree.

"The picture of the one hundred and forty-four strokes of the sickle to each revolution of the drive wheel brought this incident vividly to mind and I felt that in some way velocity and power were connected, though I did not know the meaning of the words 'velocity' and 'power' at that time. I wondered whether or not it was true that because one round of the drive wheel produced one hundred and forty-four strokes of the sickle, one pound of resistance in the sickle would hold out against one hundred and forty-four pounds of power in the drive wheel.

"I was unable to reach a conclusion as to

whether or not this was so, but I felt that if it was so, by taking hold of the wrist of the crank shaft I should be able to turn it with ease while it caused the machine to move forward or backward. Satisfied that this would be a crucial test of the accuracy of my conclusion, I resolved to try the experiment on my return home. That same evening I went to the machine shed and found, to my great delight, that by turning the crank-shaft I could easily move the reaper forward or backward on the shed floor."

CHAPTER XXIII

The Builders of Science

"A memorandum left by Henry Cavendish shows that this distinguished chemist, in dealing with a volume of atmospheric nitrogen, found in it a small residuum that was more inert than the rest of the gas and that did not behave as nitrogen should. The science of chemistry was not sufficiently developed in his day to reveal to him the meaning of the unusual behavior of the gas which remained in his tube. He died without having suspected that this inert gas was a hitherto undiscovered element.

"In 1894, one hundred years after this experiment, this same gas was again isolated in the tubes of a thoroughly trained chemist. But a century of development in the science of chemistry had wrought its changes and enabled the modern chemist to understand phenomena that were meaningless to Cavendish.

“Raleigh had not set out in search of a new element. He was engaged in redetermining the atomic weight of nitrogen, with a view to shedding light on the so-called Periodic Law, when he found that the atomic weight of the nitrogen obtained from the atmosphere was somewhat greater than that of nitrogen prepared from the nitrates.

“The highly developed state of modern chemistry gave this difference in atomic weights, which was so slight that it did not appear until the fourth decimal place was reached, a significance which it could not have had for Cavendish.

“That the atomic weight should be affected, ever so little, by the source from which the element had been prepared, was so inconsistent with modern theory that it led at once to an investigation in which the fact was discovered that the gas prepared from the atmosphere, and supposed to be pure nitrogen, was in reality a mixture of nitrogen with a small percentage of another very similar gas that differed from nitrogen chiefly in its greater atomic weight and

in its greater inertness. From this latter quality the newly discovered element derived its name, *argon*."

"Excuse me, Doctor," said the Professor. "All this about the discovery of argon is doubtless very interesting to chemists; but I must have been napping and lost the connection, for I can't see what on earth it has to do with day-dreaming, or with the reclamation of the dullard, unless you mean to suggest that the dullard later on became the discoverer of argon. But argon was discovered in England, wasn't it?"

"Ah, Professor, your day is coming. Old age is creeping up your backbone as well as mine and it will one day be leading you off also in these long, irrelevant stretches. But bear with my rambling for a little. I am coming to the point presently. I merely wanted to call attention to the fact that men like yourself, who are ahead of their time, accomplish little or nothing in the building of the science which they represent. They deserve no credit. Moreover they are not all so prudent and mod-

est as Cavendish, and they seldom content themselves with merely recording the facts and passing on.

“The greatest enemy of human progress has ever been the man who is too far ahead of his time, and who, craving notoriety, prematurely announces discoveries that neither himself nor his contemporaries are prepared to incorporate into the body of organized knowledge. When these ‘martyrs of science’ go forth and insist upon the acceptance of newly-made theories to explain their unverified discoveries, they clog the avenues of progress.

“Cavendish had argon in his tubes and noted its most characteristic quality, inertness, and yet by this discovery he added not one iota to the development of chemistry. Neither he nor his contemporary chemists were ready to deal with the facts in the case. To Cavendish, in this instance, belongs the credit of the faithful witness who simply records what he does not understand, and thus blazes the path for those who may come after.

“Men who stumble upon important truths on

the frontiers of a growing science should be given due credit for these 'accidental discoveries' if they bring the truths in question before those who are competent to deal with them, and help to incorporate them into the body of ascertained knowledge. Every science is in large measure made up of discoveries of this nature.

"But in the advance of human knowledge the highest credit belongs only to the man who makes *deliberate* discoveries. The accidental discovery brings increase of knowledge, while deliberate discovery brings not only increase of knowledge, but, what is of much greater value, it brings confirmation to the principles and theories involved and also brings to the discoverer faith in his own powers.

"Here, Professor, is where we return to the dullard. If I have in any measure succeeded in placing before you the condition of this boy, you will readily understand that his one supreme need at the time was faith in his own mental powers. He rejoiced in his physical strength, which, to some extent, sweetened life for him and rendered it endurable.

“It is true that his mental faculties had been unfolding for two or three years, but of this he had no suspicion. He had not yet escaped from the deep gloom and the discouragement that had settled down over him in consequence of early failures and early rejections. He still lived on under the old crushing conviction that he had no brains and never would have any. And yet he craved for some assurance of his mental power, even as the thirsty desert craves for water.

“When the heavy reaper moved over the shed floor that evening in response to the touch of his hand on the crank shaft, and thus confirmed his day-dream concerning the relation of power to motion, he slacked his thirst for the first time at the unfailing fountain of purest joy set up by the Creator for the exclusive refreshment of those who seek the truth and find it.”

CHAPTER XXIV

Rediscovering Fundamental Truths

"If I were not afraid of being mobbed," said the Professor, "I should ask Dr. Studevan to repeat his magic trick of last Friday evening. Dispensing with Aladdin's lamp and the genii, in the twinkling of an eye, he lifts a dullard to a place among the immortals beside Newton and Pasteur.

"The boy is so stupid all day that he fails to understand what is going on about him or to appreciate the beauty of his surroundings. He hasn't enough energy, even in the morning, to sit up straight and attend to his team; but when he comes home in the evening all tired out, he goes to the shed, turns a crank on an old machine, and presto! he is a discoverer, privileged to drink from the fountain of refreshment reserved from the foundation of the world for those who make new conquests in the realm of truth!"

"I thought you were suffering from brain-fag last Friday evening, Professor. Or was it sleep too long delayed? Your mind could not have been in its usual form or you would not have so completely missed my meaning.

"I did not say, nor did I wish to imply, that the boy made any contribution to physical science. It is obvious that he had a long road to travel before that would have been possible to him. But he thought out for himself the relation of power to weight in a simple gearing and verified his conclusions by actual experiment. As far as he was personally concerned, this was an original discovery, and for his mental life it had all the value of an original discovery, and it yielded him all the joy of one, and this, notwithstanding the fact that the truth in question was regarded as elementary ages before he was born.

"A study of the causes that led to the rise and fall of kingdoms and of empires in the past, will make it evident to any thoughtful student that the great benefactors of the race have not been the original discoverers in the fields of

science who merely add the latest items to the sum of human knowledge; they have ever been the men who cause each generation to rediscover for itself the great fundamental truths that constitute the life-blood of every civilization.

“No one should be more familiar with this truth than the Professor. The sociologist, of all men, should know the tendency of each generation to occupy itself with the latest developments along all lines, and to accept, without realizing their nature or their value, the truths and the institutions bequeathed to it by preceding generations. The history of by-gone civilizations reveals the fact that in this tendency lie the seeds of disintegration. The branch does not long survive the neglected and decaying root.

“It has often been said that in mental life, as in physical life, ontogeny is the recapitulation of phylogeny. What history has shown to be true of the rise and fall of nations, genetic psychology finds repeated in each individual life. It is this truth, perhaps more than any

other, that justifies the individual laboratory method which now obtains in all departments of scientific instruction.

“The pupil who is to be formed for effective work, either in the fields of original investigation or in the provinces of applied science, must not be allowed to content himself with accepting the mere statement of fundamental scientific truths. He must work out for himself and verify each great fundamental truth in his chosen field of science. In this way his knowledge becomes vital, his perceptive powers are quickened, his range of view is broadened, and he acquires resourcefulness in dealing with complex problems and self-reliance in the presence of difficulty.

“When an attempt is made to lead the pupil to the desired goal by a more direct route and when mere instruction is substituted for individual work, the student, at the end of his course, finds himself in possession of a set of sterile formulae instead of being the master of a developed science.

“Lest the Professor should again misunder-

stand me, let me emphasize the obvious truth that if the pupil were denied all assistance and left entirely to his own resources all scientific progress would be at an end.

“The pathway of science is too long and it is beset by too many difficulties to be traversed alone by any one individual. It would be absurd to suppose that the efforts of a single lifetime would suffice, even for the most highly endowed among the children of men, to accomplish a work that is the result of the co-operation of countless generations of the world’s greatest thinkers.

“Libraries, schools and teachers are set apart by society for the express purpose of transmitting to each pupil the accumulated inheritance of his race. But this does not mean that the pupil may set aside the laws and the constitution of his own nature wherein it is written that he must pass through each successive developmental phase before reaching the plane of adult mental life.

“The agencies set apart by society to aid the pupil in his progress should keep him from

wasting his energies in futile endeavors and from wandering in devious ways; they should place before him in their proper sequence the problems which he must solve for himself; they should place within his reach the means by which he may extricate himself from his perplexities. If these agencies perform their functions properly, the pupil will, in his few short years of school life, cover ground that would require centuries of unaided effort.

“If this preachment has led me too far afield, you must blame the Professor for it. At the time in my life of which I have been speaking I had been left practically to my own resources for a period of about seven years. During this time I was away from school; the world of books was closed to me; I had no teachers; the people around me were, in my imagination, denizens of a higher world who possessed brains and who had had the advantages of an education and I did not expect them to understand my difficulties nor to engage in any futile attempts to lift a brainless boy to the mental plane on which they lived.

"Years were consumed in taking the first few steps on the long road of knowledge. Through the expenditure of my muscular energy and through daily contact with the simple forms of elementary machinery I had, however, succeeded in incorporating into my mental life a few of the most rudimentary concepts of physical science. These were now integrating themselves in my day-dreams as I followed the plow or drove my team to market.

"In the day-dream which I related to you the other evening this integrating process had finally reached the stage where it moved me to experimental verification. The success of my experiment with the reaper, trivial as it may seem to men like the Professor, who have only memories of a brilliant childhood spent in school under competent teachers to fall back on, meant more to me than they can ever understand. It was the first tangible proof I had that I was not totally devoid of mental power and it filled my imagination with dreams of future conquests that were destined to tease me for years to come and that my so-

called judgment condemned as the vain fancies of a fool and set aside lest their expression should bring upon me well merited ridicule."

CHAPTER XXV

A Successful Invention.

“Day-dreams such as that of the reaper, followed by experimental verification, were, however, only the prelude or the blossoms, the fruit came later in that same summer in the invention and the building of a grubbing machine that worked.

“On the bank of a beautiful little inland lake that skirted the southern extremity of my father’s farm, there once stood a majestic grove of black oaks that for more than a century had sheltered the wigwam of the Sioux. In the early fifties the finest of these trees fell before the axe of the pioneer, who converted their straight trunks into logs with which to build his hut or split them into rails with which to enclose the first few acres he had hewn from the primeval forest. But the life of these trees was beyond the reach of his axe in the wide-spreading roots where it lay safely hidden from

the frosts of winter. At the first call of spring the tide of sap rose to the surface and not finding its accustomed channels, built for itself around each stump a clump of suckers whose dense foliage during several subsequent seasons afforded a secure nesting-place for the brown thrush.

“At the time of which I speak, a quarter of a century had transformed these suckers into clusters of vigorous young oaks whose trunks had grown together at the base and whose roots were intertwined in an inextricable mass.

“Under a scorching July sun, with scarcely a breath of air stirring, and with a crew of half a dozen workmen to help me, I was engaged in clearing this field for the plow. The roots of the dense underbrush of hazel and sumac that had been cut during the previous winter formed a close felt-work in the loose soil that prevented the use of the spade and made difficult the work of laying bare the roots of the trees for the axe. When the outer circle of roots had been removed, the task of reaching the small roots under the center of the cluster

became tedious and exasperating and even when the last of these roots had been cut, the base was so large that the cluster retained its erect position.

“Under similar circumstances on a former occasion I had seen Bernard make use of a team of horses and a block and tackle to bend the clusters to one side and thus facilitate the cutting of the few central roots. I was tempted to resort to this expedient, whereupon I remembered my day-dream about the relation of power to motion and my experiment with the reaper. This led me to the conclusion that a combination of the pulley and the wheel and axle would yield better results.

“The more I thought over the matter and the more exasperated I became at the slowness of our progress, the more firmly did this idea take possession of me. A heavy rain kept me indoors next day. As soon as I finished my chores I went to the shed and began to dig out discarded farm machinery, in search of the wheels and shafts which I needed for the construction of the machine that I had planned

while on the grubbing field the previous day.

"I worked feverishly all day, during the course of which I was more than once questioned by the workmen and by the members of the family as to what I was doing. I had only one answer for all such questions, 'Nothing, just fooling.' My previous failures had taught me prudence. Realizing the possibility of another failure and shrinking from the ridicule which it would be sure to bring upon me, I resolved to satisfy myself that the machine would be a success before telling any one of my plans or hopes.

"Among the old machinery was the body of a mowing machine that had been built in Baltimore in 1859 and shipped to Mendota by way of the Chesapeake & Ohio canal and the Ohio and Mississippi Rivers. The sickle-bar had been lost in transit and had not been replaced and, consequently, the machine had never seen actual service. One of the first of its kind, it was heavy and clumsy in construction; its shafts and wheels had many times the strength

needed for mowing, but they just suited my purpose.

"I struggled for some time in the vain endeavor to remove one of these wheels, but it had rusted to its shaft and defied my best efforts. When I realized that I could not dislodge the wheel with the tools at my disposal, it dawned upon me, that, by slightly modifying my original plan, I could alter the mowing machine so as to make it serve my purpose.

"Before I went to bed that night I had my grubbing machine well under way and by working after supper into the late hours of the night I had it ready for trial inside of a week; but the test could not be made while others, who would discover the purpose of the machine and be witnesses to a possible failure, stood around. The following Sunday morning I remained at home to 'mind the house' while the rest of the family went to early Mass.

"The machine was mounted on two wheels, and as soon as I was left alone I ran it out of its place in the shed and anchored it to one of

the trees in the yard. With a piece of new half-inch rope I connected the drum with a neighboring tree and began turning the crank. The rope gradually tightened and almost before I felt the pressure on the handle it snapped.

“A tide of joy surged over me such as only those who have lived through long years of discouragement will ever understand. I had brains! I was an Inventor!! The desire for concealment was now changed into a feverish impatience to exhibit the machine to the family and the time until they returned from church seemed interminable.”

CHAPTER XXVI

A Family Wetblanket

“A detailed description of this rather primitive grubbing machine would hardly prove interesting. As it stood in the yard that Sunday morning, while I waited impatiently for the family’s return, it was simply a combination of wheel and axle in which the proportion of power to weight was as 1 to 2,400. Fortunately for me, the body of the machine was very strongly built. The shaft turned in brass boxes and the wheels were held in mesh by a heavy iron frame-work. The workmanship on the construction of the mower was so good that there was comparatively little friction in the running gear.

“In this instance, unlike that of the reaper, my knowledge of the relation of power to weight was not a mere approximation depending upon sense memory. I had made actual count of the number of revolutions of the crank

required to cause the main axle to revolve once, and this axle, or drum, for as such I used it, was two inches in diameter, whereas the diameter of the circle traversed by the crank was thirty-six inches. I was well aware, therefore, that every pound of power applied to the handle was transformed into something more than a ton by the time it reached the rope. I knew that the 2,400 pounds would be reduced somewhat by friction, but the extent of this reduction was utterly beyond my power to calculate.

“I believed that as soon as I could convince my brother of the value of the machine I could get such improvements for it as I desired. I had counted on using four pulley blocks, which I knew would change the relation of power to weight from 1 to 2,400 to 1 to 384,000. This would, of course, be somewhat diminished by friction. Moreover, I could at this time lift five hundred pounds and I calculated that I could easily enough apply at least half of this to the crank, the handle of which I had made long enough and strong enough to allow two

men to exert their combined strength in turning.

"It is a simple matter to multiply 384,000 by 500 and thus reach the conclusion that two men could exert a pressure of 192,000,000 pounds on the tree which it was desired to pull out by the roots. But the multiplication table was still an impenetrable mystery to me and I simply knew that two men on the crank would be able to exert a tremendous pressure on the clusters of young trees that had been annoying and baffling me during the previous week.

"My imagination was on fire with all this and with the wonderful things that the grubbing machine would surely accomplish. I thought of the forests that were still to be grubbed and feared that they were not extensive enough, and of the patents that were to be taken out, and of the money that was to be made, and I am afraid that before the hour had drawn to a close I was a millionaire in imagination. In the midst of it all, the thought kept continually obtruding itself that whatever my shortcomings in other respects, and prob-

ably I judged myself at this time more severely than others did, there was at least one thing for which I had brains, and a glorious career as a machinist and an inventor seemed to stretch out before me.

“At last the family arrived. The carriage stopped just in front of my machine. I was standing with my hand on the crank, with my heart ready to burst with joy, not to mention the condition of my head, but to my surprise and disappointment not one member of the family would bestow even a single glance on me or on my machine. As Joe threw the lines over the dashboard and stepped from the carriage I tried to tell him about my wonderful invention, but I was chilled by the reception which the others gave me, and the unsympathetic look on his face caused the words to stick in my throat, as he turned towards the house with the peremptory order, ‘Ed, put up the team right away.’ ”

CHAPTER XXVII

The First Triumph

"The next morning I hitched the grubbing machine behind the wagon, intending to take it with me to the grubbing field, which was at the other end of the farm, but Joe appeared on the scene and forbade the procedure. I remember his words still; they hurt and angered me more than anything he had ever said to me. 'Unhitch that thing and leave it here, and quit wasting the men's time with your fool machines.' In my experience, no one had ever questioned Joe's authority; his word was law on the farm. So, with a heavy heart and a rebellious will, I unhitched my grubbing machine and went back to dig out the clusters of young oaks without its aid.

"At noon, however, I found that Joe had gone to town, so I again hitched the machine behind the wagon. Whatever the consequences

might be, I was determined to see the thing through and to give my machine a fair trial.

“My father was going to Bernard’s house and he rode with me as far as the grubbing field. He scolded me all the way for my disobedience to Joe, but he did not himself forbid me to take the machine to the field. When we reached the grove I wanted him to wait to see the machine work, but this he positively refused to do.

“I at once proceeded to anchor the grubbing machine to a stump and to attach the pulley to a cluster of oaks that I had partially grubbed out in the forenoon. To my great joy, it came out without difficulty, and all my dreams returned to me in spite of the family wetblanket. In pulling the second cluster, however, I broke the chain; my chief difficulty now was to get anything strong enough to hold me. I had brought along all the chains I could find about the place. After my experiment the day before, I knew that a half-inch rope was practically worthless and there was no stronger rope available. The log-chains were clumsy and not

what I wanted, but, under the circumstances, they were the best I could get. In the following two hours I think I must have broken the chain half a dozen times. I had learned to measure neither my power nor the strength of the chains.

"About four o'clock in the afternoon my brother's hired boy happened along, apparently by chance, but he told me, *sub rosa*, that my father had sent him down to see whether the machine was working or not, and had cautioned him not to tell me that he was sent. We had results to show him that made his eyes bulge. He told me that there was a coil of new inch-rope in Bernard's barn, which my brother intended to use in digging a well, and he volunteered to bring it to me. Half an hour later he returned with the rope, and with him was my father, who watched the operation of the grubbing machine with unfeigned delight.

"When we reached home that evening, Joe was eating his dinner. He had just learned of my disobedience, and, for the first time in

my memory, he seemed genuinely angry. And notwithstanding the fact that there were strangers in the dining room when I entered, he turned sharply on me and reprimanded me for disobeying orders.

“But father stopped him saying, ‘Never mind, Joe, Ed did more work this afternoon with his grubbing machine than the crew could do in a week without it. You had better hitch up in the morning and go to town and get him everything he wants for it.’ ”

CHAPTER XXVIII

The Parting of the Ways

"Did you make anything on your patent, Doctor, or did you let some one cheat you out of it as is usual in such cases?" asked Mr. Eaton.

"No, I never took out a patent on the grubbing machine. If I had had the money at the time I would undoubtedly have applied for a patent. But Joe, who held the key to the family exchequer, did not see the thing in that light. His good judgment in this matter probably saved me from a mistake which would have changed the whole current of my life. He was well informed on such matters and knew that only a small percentage of the inventions that are patented ever pay the expense involved.

"The grubbing machine did good service during the following two or three years in clearing my father's farm. But apart from the

saving of time and labor involved in this it never brought me a cent. Its value, as I look at it now, was not to be measured by the dollar standard, nor did the machine contain any important addition to the science of mechanics. Its value was almost wholly personal and chiefly subjective.

“The construction and the successful operation of this machine, however, had many far-reaching effects on the development of my mind and character. Some of the incidents connected with this are worthy of more than a passing glance from those who are interested in the problems of mental development.

“My revolt against my brother’s authority, for instance, trivial as it must have seemed to my family, or to the casual onlooker, was in reality the turning point in the formation of my character. The child naturally obeys the individual. But when he becomes a man he must put away the things of a child. He begins to be a man in that hour wherein he learns to transfer his allegiance from individuals to principles and when that hour comes he

must make the transition or a second opportunity will, in all human probability, never be offered and he will remain during the rest of his natural life a mere tool or chattel in the hands of others.

“Strength and stubbornness, on account of their superficial resemblances, are often confounded, and yet they are in reality separated from each other by polar distances. Strength of character is measured by its unswerving loyalty to truth and to the principles of justice as these are revealed in the individual consciousness. Stubbornness, on the contrary, follows neither truth nor principle nor justice; it is animated solely by egotism and vanity. The persistence which the stubborn manifest in pursuing a course of action that they have once entered upon is not relieved by insight or imagination; it is not guided by reason or principle; it partakes of the nature of that blind momentum that is found in masses of moving matter.

“It is needless to say that I did not indulge in any character analysis at the time. In this.

I was not unlike other boys who come to the parting of the ways that lead either to freedom or to slavery. The decision must be made, in large measure, on the basis of instinct and of trivial circumstances, and without the aid of that larger discourse of reason that enables the mature mind to look before and after. I had no realization of the consequences. It did not occur to me in my revolt against my brother's authority that I had come to the parting of the ways and had already taken the most important step that I would ever be called upon to take. But the effect of this revolt on my consciousness was none the less permanent and far-reaching on that account. In fact, the law underlying the transition from obedience to individuals to obedience to principles was implanted in my consciousness on this occasion under conditions such as gave to it an immediate and vigorous development.

"The thought of the grubbing machine had been born of my necessity under the broiling July sun and of my day-dreams during several preceding years, and when I tested the machine

on that Sunday morning, and when the rope snapped at the touch of my hand, theory glowed to incandescence and burned the truth in question into the depths of my consciousness.

"There was left in my mind no shadow of doubt that the machine would do the thing that was needed to be done on the grubbing field, and consequently there was no doubt in my mind that it meant the saving of time and money to the family as well as triumph to me. These convictions were formed and crystallized in a mind that was glowing with emotions of many kinds. Triumph had at last succeeded repeated failures; self-reliance had taken the place of vacillating uncertainty; the consciousness of mental power replaced the abiding conviction of my own stupidity.

"The indifference of my family, disappointing as it was, and the contempt for me involved in my brother's order, however they may have chilled me, were powerless to efface the conviction that had grown up in my consciousness. Besides, it was I who was doing the grubbing

and not my brother, and in his order I saw only harshness and injustice for he condemned the machine without taking the trouble to look into its merits.

“Of course I can now see the reasonableness of my brother’s course of action. There was so little to be hoped for from the omadhaun, and there was such a small chance of his inventing and building a machine that would work, that common sense would prevent one from looking into it. I have, myself, taken a similar attitude many times since under like circumstances. But on that morning I could see only my side of the question. My brother’s action in the matter appeared to me as the action of a tyrant, and it stung me to my first act of open rebellion against his authority.

“After all, success measures the distance between treason and patriotism. Be sure that you are right and then go ahead is good advice. Retreat is difficult and dangerous at best; in most cases it is fatal. Nerve currents never double back on themselves. All nerve currents emerge ultimately on the motor side

of life. 'He that putteth his hand to the plow and looketh back is not worthy of me.'

"I remember that I was very deeply impressed some years after the time of which I speak by a description of a thrilling scene at the Natural Bridge in Virginia which I found in one of the school Readers. The ambitious boy, in his desire to inscribe his name higher than that of any other that adorned or disfigured the sandstone cliff, dug a niche for his foot and another for his left hand and thus lifted himself a foot or two at a time until he had carved his name above all the others on the mighty wall. But not satisfied with this he cut and carved again and again until he had attained a height from which there was no possible return; his only safety lay in reaching the top. With bated breath and agonized prayer his friends below watched his slow progress upward as with despairing energy he cut niche after niche in the flinty limestone until his knife, worn to the haft, dropped from his nerveless hand. But he had cut his way out from under the overhanging arch to a point

where he could be seen by those watching from the bridge above, and as one tired foot slipped from its niche a rope was dropped over his shoulders and he was drawn up to safety.

“This, after all, is a true picture of life. ‘Nothing succeeds like success.’ The child is governed by the immediacy of the pleasure-pain reaction. This is true also of the animal; but man must rise superior to this and the vision of ultimate good must give him strength and endurance to bear present pain and to overcome all obstacles in its achievement or die in the attempt. And it is important that this lesson be learned once for all on the very day on which the boy, by transferring his allegiance from men to principles, ceases to be a boy and becomes a man.

“Had my grubbing machine failed me on that day, my brother’s rebuke in the evening would have crushed me utterly; and in all human probability I should never again have followed my conviction when it led me beyond the narrow pathway of the letter of the law. The very glow of emotion and all the pent-up

feelings that went into that revolt against my brother's authority and into the trial of the machine would have burned failure into my consciousness so as to determine the course of subsequent events as certainly as the success of the enterprise actually determined their course in the opposition direction."

CHAPTER XXIX

Illusions

“I now know that the success of the grubbing machine was a pure accident. Had I carried out my original plan, it would have failed utterly, and this for the same reason that the grindstone experiments failed. I had planned on using for the grubbing machine a wooden frame on which I intended to bolt boxes. Had I carried out this intention the wheels would have pushed away from each other as soon as the strain came upon them. Of course a wooden frame could have been so constructed as to hold a double-back-gearing in proper alignment, even under very heavy pressure, but at that time I was wholly innocent of the principles of mechanical construction involved in such machines.

“So I really owed the success of my grubbing machine to the fact that I was unable to dislodge a few rusty wheels from their shafts,

and was in consequence led to accept as the basis of my machine an iron framework that, although built for entirely different purposes, had sufficient strength to support the strain that was put upon it in the grubbing machine. I did not, however, advert to this circumstance at the time and took to myself the full credit for the successful working of the machine."

"Doctor, didn't this invention of yours make your mother very proud and happy," asked Mrs. O'Brien.

"Yes, I suppose it did for the moment, but at this late date I have no way of ascertaining just what effect the incident had on the various members of my family. Of course, after father's announcement of the success of the machine I was asked to explain its working and to state what further improvements I needed. But I hardly think you can form an estimate of how impossible it was for me to put my thoughts into words. At that time it was far easier for me to handle an axe or a grub hoe than to use my mother-tongue. For years I had remained silent, speaking only when it was

absolutely necessary; and what little power of speech I was possessed of under ordinary circumstances deserted me now in my excitement.

“I have sometimes wondered why the peacock struts and exhibits his gorgeous plumage. What benefit does he derive from the practice apart from the exercise involved? And yet his strutting is an instinct that has been formed under the pressure of untold ages in the struggle for existence and it must be possessed of some real value to the race. Is it a similar law, I wonder, that makes each one of us strut at some time or other in our lives?

“I do not believe that I had an opportunity, perhaps I did not even have the desire, to strut when I was a child and now when I was sixteen years old all the pent-up struts that my infancy should have known suddenly rose up within me and in their frantic efforts to exhibit themselves simultaneously left me paralyzed and devoid of speech.

“I had grown morbidly self-conscious during the years of my discouragement, and now in

the moment of exaltation I became still more self-conscious. To me the grubbing machine seemed to fill the whole heavens. I could not understand how any one who knew of it could think of anything else. It was so full of indefinite possibilities that I feared some one who saw it working would anticipate me at the Patent Office and rob me of the just fruits of my discovery.

"It was but natural that I should interpret the impression made upon the members of my family and upon others who saw the machine work by my own wildly exaggerated notions of its importance. As I look back at the occurrence, I realize, of course, that the impression actually made upon those around me was not at all in keeping with what I then supposed it to be.

"That my family were surprised and pleased at the originality and initiative displayed by the omadhaun there can be no doubt, but for all that, my grubbing machine could not have gone far towards changing their estimate of me. As far as I know it did not even awaken

in them the buried hope of giving me an elementary knowledge of the three R's.

"This state of affairs must not be thought strange. The invention objectively considered was trivial to a degree, and it could hardly be expected that any of those around me would understand its subjective value. And, after all, are not the subjective values the real values? It would be hard to overestimate the value of this poor grubbing machine to my mental life, and it is just as well to remember that this value was due almost wholly to the fictitious importance which I attached to it. I can never be sufficiently grateful to Providence that in those days there were none of those well-meaning fools at hand to enlighten me concerning the real value of my invention. Had I been able to see the naked truth it would have shattered my bubble of conceit and left me in the slough of despond.

"Mud pies, houses of cards, doll houses, pop-guns, and kites are to us grown-ups trivial matters, but they are often filled with tragic importance to the child. Perhaps, some day,

when we view all things in the unchanging light of eternity, our adult hopes and large ambitions, our latest discoveries, our railroads, canals, and games of empire will seem as trivial in their objective importance as do those games of childhood and we shall come to understand that the only real importance of achievement is the subjective importance.

“My family had the good sense not to undertake to disillusionize me. They had a word of praise for the machine whenever it was mentioned and they exercised a quiet but firm restraint whenever I spoke of taking out a patent. It is true, however, that I did not trouble them much with my dreams and ambitions. I was not communicative and I seldom ventured to speak of these matters to any one. This silence was a blessing for it saved me from the ridicule that would undoubtedly have been bestowed upon me had the content of my mind been expressed in words.

“One of the best fruits of my silence, perhaps, was the fact that my illusion was allowed to run its natural course. I hardly dare say

it, but it has seemed to me many times that illusions are our salvation. I feel sure that it was so in my case at least. The truth would have left me paralyzed and in a slough of despond to the end of my days. It was the bright, flashing illusion, a mere rainbow of ambition, that led me up out of the valley of darkness and discouragement.

“Of course the illusion could not have lasted long under any circumstance; it is notorious that we can not long continue to believe in visions of this sort without tangible assets, but in my case the disillusionment came gradually, and each stage of it was produced by some achievement or by the attainment of some truth that was of permanent value to me, so that by the time I had grown out of my illusion concerning the importance of the grubbing machine I had learned to form a juster estimate of my own powers and the germ of hope had begun to set its roots deep in my nature.”

CHAPTER XXX

Transitory Phases

“Doctor,” said Miss Russell, “your paradoxes last Friday evening proved too much for me. I did not object at the time because I felt sure that you could not have meant what you seemed to say, but the more I have thought about the matter the more puzzled I have become. Did I understand you to say that error and illusion saved you where the truth would have left you crushed and paralyzed? Do you mean that error and illusion are ever good? that they are ever better than the truth for a sane mind?”

“Our work in school is made up largely of efforts to eradicate error and dispel illusions from the minds of the children. You surely do not disagree with this policy? You would not have the children grow up in error and illusion?”

“My dear Miss Russell, you are not the first

one who has found it difficult to unravel that riddle. But it is well to remember at the outset that the God of truth ordained that we should give milk to babes and meat to men, and that even at the last He said to His apostles, 'I have many things to say to you, but you cannot bear them now.' What do you think He meant by the parable in which the servants come to the master filled with indignation on having found cockle growing up with the wheat, and anxious for permission to pull it up; but the Master said, 'Let it be until the harvest, lest in pulling up the cockle you should pull up the wheat with it.'

"There is no real disagreement between us. Truth is life and freedom to the mind; the only question is how we shall attain it. Have you not heard the old story of the two men who built a shanty, and having nailed on the last board from the inside, one said, 'Let us cut a hole to let the dark out,' and the other replied, 'No, but let us cut a hole to let the light in.'

"The salvation of the child must ultimately

come from the truth ; but the question is, how shall he attain the truth? It's a graceless task to go about plucking error and illusion from the child's mind. The human mind grows in knowledge under the law of development wherein it is written that each subsequent phase shall be attained through the reconstruction of the previous phase. In the human mind you cannot build with the naked truth ; the mind cannot look upon it and live. The child needs his fairy stories and Santa Claus and his childish settings for all manner of truths.

"The crayfish can grow only by casting off its shell from time to time, but if, in your mistaken zeal to help it in its growth, you proceed to tear off the shell, you will kill it instead of helping it.

"Error and illusion, after all, are but the natural limitations of the mind's growth ; they drop away as naturally and as inevitably before the light of growing truth as do the shadows before the rising sun.

"It is quite true that, looked at in one way, the teacher's duty may be said to consist, in

large measure, in the correcting of the pupils' mistakes and in the dispelling of their illusions, but it does not follow, on this account, that the teacher is to play iconoclast and spend his time in endeavoring to make young children see the truth through adult eyes. The teacher should correct the children's errors by putting something better in their place in the minds of the children, something truer, something more beautiful. This will help to lift them into a larger and purer mental life.

"If I had time to go into details in my own story, I might easily point out to you the working of this principle. If on the evening of my first success with the grubbing machine, some one had made me realize its paltriness and shown me what little significance it had for the world at large, I would have been crushed and would have had nothing to fall back on. But as it happened, I was allowed to dream dreams that night of my wonderful achievement, and the next day my brother took me to town with him to purchase the needed improvements, having found it impossible to

obtain from me a sufficiently accurate description of what I needed.

“We visited the largest foundry and machine shop in the city, and there, with wonder and delight, I saw for the first time lathes, and drills, and planing machines, operating with quiet, irresistible strength, and with what seemed to me to be almost human intelligence.

“When I returned home that night my grubbing machine had, somehow, shrunk many sizes; nevertheless, there was no grubbing machine in the machine shop and I, Studevan’s omadhaun, was the inventor of one, and even if it were not such a great thing, it was something. I conceived a burning desire to be a machinist. I felt that if, without ever having seen a machine shop, and without the aid of any of its superb appliances, I had been able to make the grubbing machine, I would surely be able to do great things after I should have learned my trade.

“The following winter I begged my father again and again to obtain for me a place where I could serve my apprenticeship as a machinist;

when he refused I determined to run away from home and learn the trade on my own account. I actually visited every machine shop in the Twin Cities and offered my services to the foreman free if he would just take me in and let me learn the trade. But after one look I was rejected at each and every shop. It was rather hard, to be sure, on a budding inventor, but I had been pretty well sobered down by this time. I had come to realize that the rest of the world had concerns of their own, and that for some strange reason they were more interested in other things than in grubbing machines or their inventors."

CHAPTER XXXI

Self-Reliance

“Doctor, I am sure that you will make it all clear to us in the end, but at present your account of the grubbing machine incident leaves me more at sea than ever,” said Miss Ruth. “Wasn’t it a mean trick that Fate played you in first lifting you up to the seventh heaven of triumph and then slowly submerging you in what must have been a very deep discouragement? Your rejection by those stupid foremen must have left you utterly wilted and in a condition that, on the face of it, seems to be much worse than that in which you were before you began work on the machine. I fail to see how the whole experience could have been anything to you but a calamity no matter how it terminated. If any of those foremen had had sense enough to accept you and to give you an opportunity to learn the machinist trade

in his shop, doesn't it seem probable that you never would have returned to school? On the other hand, whatever actual development resulted from your partial success and the discouragement at its close must have removed you further than ever from books and school."

"Appearances are as you say, Miss Ruth, but this is largely due to the fact that I have not yet stated fully all the circumstances of the case. In the first place, let me say that the shrinkage in my idea of the importance of the grubbing machine and my failure to obtain a position as a machinist's apprentice did not discourage me as much as might be supposed.

"In spite of all the disappointments and humiliations that befell me during that Fall and Winter, there remained with me an abiding conviction which nothing could shake that the grubbing machine was a real success; the magnitude of the success was quite another matter.

"During that summer the machine had enabled me to pull out hundreds of trees by the

roots with my own hands. Again and again I had snapped a two-inch cable with the multiplied power of my own muscles. Every time a great oak tree bent over under the strain put upon it, and every time that root after root snapped a hundred feet from me and shook the earth beneath my feet, I felt myself to be the source of a mighty power; and the energy that went out from my arm over cable and chain returned in a tide of strength to my will and built there the foundations of self-reliance.

“Even when those foremen, one after another, refused my application, I attributed the refusal to my uncouth exterior, and went away with the comfortable conviction that there was something in me much better than anything that had hitherto appeared on the surface. I knew that if I could only make any one of those foremen realize my real worth, he would gladly welcome me to his shop.

“In this was I so different from the rest of men? If we were all entirely candid, would not most of us confess to a lurking conviction that



there are a few nuggets of real worth in us that have not yet appeared on the surface?

"It was well for me that my exaggerated notions about my invention should in time be reduced to something like proper proportions. I think it is well for all of us to be freed from too great inflation in matters of this kind, but we must not forget the other necessity, i. e., that this reduction take place gradually so that it may leave with us all that may be of real value.

"Sudden disillusionment usually destroys our legitimate faith in ourselves; it is like the pulling up of the wheat with the cockle, against which the Master so pointedly warns His disciples. It was fortunate for me that my sense of the importance of the grubbing machine dwindled down to proper proportions very slowly and that while this was taking place, I succeeded with several other more or less trivial devices, which, joined to the kernel of real value that was in the invention of the grubbing machine, gave me a basis of hope which, however modest, was very real.

“Speculating on what might have happened if this or the other circumstance in one’s life were different is hardly a profitable employment; but it does seem as if it would have been a real calamity to me had I at that time found a shop in which to serve my apprenticeship to the machinist trade. Had that happened, it is probable that I would today be a mechanic, probably a good mechanic, if that term may be applied to an illiterate man; but it is probable that had I then learned the machinist’s trade I should never have gone back to school.

“As things actually fell out, it would seem at first sight as if the training of my senses and of my muscles, the development of the number concept and of the sense of geometrical relations, the combination of these factors in my day-dreams and their concrete expression in the invention of the grubbing machine and of other simple mechanical appliances would have led me further than ever from books and school.

“And yet, as I look back over the events of those years, I can not escape the conviction that my education would never have come to me, that I would never have had even a desire for it, were it not for my development along those lines that on the face of things seem so far removed from what usually passes for education.

“An experience of twenty years with dullards has convinced me that we are here in the presence of a natural law. The dullard's one hope of salvation is bound up with the phase of his mental development that is directly related to concrete reality.

“The sensory-motor reaction lies at the basis of mental life and until this is developed and made the standard of interpretation, the knowledge contained in books and language remains sealed. But once we have secured a vigorous development along these lines, it will be found comparatively easy to divert the flow of mental energy into other channels.

“In this way, it will not be difficult to bring about gradually a symmetrical or balanced de-

velopment, which should be the aim of all true education. On the other hand, there is no surer way to defeat all the purposes of education than to cram book learning into a boy's mind before he has any desire or capacity for such knowledge and while all his being is crying out for the elemental things involved in sensory-motor experience.

"The development resulting from concrete experience with nature, is much more intimately connected with that development which exhibits itself in letters than appears on the surface. It is not improbable that the world is indebted for the genius of Shakespeare to the fact that he escaped too much formal drill in school and to the further fact that many of the happiest hours of the boy's life were spent in the woods listening to the song of birds and to the murmur of the breezes in the treetops, with his senses bathed in the perfume of wild flowers, while he chased the squirrel to its nest, or watched the wounded fowl creep in among the sedges.

"Had he been forced to spend those hours,

as too many of the children of his generation and of subsequent generations have been forced to do, seated on a hard bench, his feet dangling, trying to engrave on the tablets of his memory the a, b, c's, while his soul was in angry revolt, his heart never could have been the source of the sweet songs that have charmed the world."

CHAPTER XXXII

Learning to Read

"I have already given you an account of my first abortive attempts to read. When I first went to school I could read fairly well for a boy of six; that is, I could read the simple phrases of Wilson's First Reader. I was immediately promoted to Wilson's Second Reader, where, as far as I now remember, I also succeeded fairly well. But early in my eighth year, probably because the teacher did not want to have me in a class by myself, she made the mistake of putting me into the class with children older than myself, who were reading in the National Third Reader.

"Nothing was done by the teacher to bring to us a realization of the content of the literature that we tried to read. The selections in the Third Reader were all classical and were

chosen without any apparent regard to the limitations of a child's vocabulary. There was consequently little chance that the children would understand what they were reading.

"To be sure, we were required to memorize some of the words with their definitions; but all this was a meaningless memory drill for most of us, and, as far as I was concerned, it was entirely beyond me. Many of the words I could not even pronounce, and whenever I was called upon to read, I stumbled hopelessly, felt humiliated before the whole school, was laughed at by the children, and scolded by the teacher. I ended up with the conviction that I 'had no talent' for reading.

"I have since encountered a great many children of all school ages who had made similar discoveries with regard to the limitations of their talents. In every case that I have had an opportunity to investigate I found the cause to be the same: an unwise anticipation of some phase of the child's mental development.

"I have already said that before I was nine years old I knew my catechism by heart from

cover to cover, and it will be admitted that the catechism holds its own, even with the National Readers, in its total disregard of the child's capacity to understand. There are few readers of any series that can produce such a splendid array of long, and to the child, unpronounceable words as are to be found in the catechism. I learned the catechism through my ear rather than through my eye, and for this reason it helped me but little with my reading. My sister 'heard my lesson' every evening. As a matter of fact, she pronounced it for me, word for word, and repeated it with me, over and over again, until I could say the lessons from beginning to end, questions and answers, without a hitch.

"But transubstantiation, indefectibility, infallibility, sovereignty, etc., had no more meaning for me than the transmagnificandandubobanciality that was commonly used at that time for practice in syllabification.

"It is not surprising, therefore, that when I was taken out of school at nine years of age I had lost all desire to read. I do not remem-

ber to have opened a book or to have attempted to read a paragraph in a newspaper until my return to school at the age of thirteen. My attempts to learn to read during that brief interval of school life were not very successful, nor do I recall that there was any improvement in the method of teaching the art of reading.

"There were between twenty and twenty-five children in my reading class. When the bell rang for the lesson, we lined up according to the places that we had held in the spelling exercise at the close of the preceding lesson. The pupil at the head of the class read the first paragraph of the two or three pages assigned for the day's lesson. Straightway, each one of us counted the paragraphs and calculated which one would fall to his turn. He neither knew nor cared what went before nor what came after his own paragraph.

"That this was an unintelligent mode of procedure I readily grant, but after all, it was only the logical outcome of the method of teaching the art of reading then in vogue.

“During the three months of my stay at school I do not remember that the teacher ever offered a word of explanation or of comment on the subject-matter of the reading lesson. She taught us how long to pause for a comma, a semi-colon, a colon, and a period. She drilled us in the proper pronunciation of the words, and in the correct inflection before a period and before an interrogation point. But the personality of the author, the circumstances under which he wrote, the purposes he was striving to attain, or any of the information that would have helped us to a correct interpretation of what we were to read, did not seem to possess any interest or value for the teacher. The lesson consisted of two or three pages of an extract cut out of the body of some classic; the reading book gave no synopsis of the text from which the lesson was taken, nor did it give any account of the circumstances which called it forth. There was no library within reach where we could have looked up the context and learned of the circumstances that had called forth the sentiments expressed in the les-

son, even if by any strange chance one of us had conceived the idea of doing so.

"It is quite possible that the teacher had no better library facilities in this respect than we had; so she should not be blamed too severely for not having furnished the class with information that, however necessary to the intelligent carrying out of the work on which we were engaged, was as far beyond her reach as it was beyond the reach of her pupils.

"I was three or four years older and very much larger than the other members of the reading class and I have not the slightest doubt that I was the poorest reader among them. To make matters worse, during my four years' absence from school I was removed from the companionship of children and had, in consequence, grown shy and awkward in my intercourse with them. The conditions were, therefore, anything but favorable to my making a new and successful beginning in the difficult art of reading.

"The experiment proved to be one long-drawn-out humiliation. Each day recorded a

fresh failure and increased my discouragement proportionately. The teacher no longer scolded me, but her silence was quite as disconcerting. The pupils did not laugh at me openly, but their pity was more galling than their laughter would have been. Do you wonder that during those three months my aversion to books was deepened, or that when I left school it was with a certain sense of satisfaction that I saw myself released forever from the hateful task of reading?"

CHAPTER XXXIII

A Widening Horizon

"I have no recollection of making any attempt to read during the three years that followed. As we have seen, my mind was developing along other lines during this time. I was not, however, totally devoid of imagination, for I remember well that I listened with eager pleasure to the ghost stories and fairy tales that were occasionally told by the old folks as they sat around the fire of a winter's evening; and I was scarcely less interested in the stories of Indian warfare and of the wild west life in the mining camps that were swapped by the men as they worked beside me in the field or as they smoked their after-dinner-pipes under the shade of the wide-spreading oak in our front yard.

"My failure to seek in books food for my hungry imagination or companionship for my

hours of loneliness was not due to lack of example. All the members of my family were fond of reading and devoted to this occupation the odd moments that could be spared from their duties, but they seldom read aloud.

"I had no suspicion, therefore, that the kind of stories that interested me were to be found in books, nor would my attitude have been changed had I dipped into the volumes in our little family library. On the shelves in our one book-case were to be found only such ponderous and solemn works as Lippincott's Gazetteer, the Bible, Milner's End of Controversy, The Knowledge and Love of Our Lord and Saviour Jesus Christ, Nathan's Church History, Spalding's Miscellany and his History of the Reformation, Balmes's European Civilization, a treatise on surveying, The Lily of Israel, The Explanation of Miracles, Rodriguez Christian Perfection, etc.

"It is true that such works did not furnish forth the customary reading matter for the family. A few volumes of lighter literature were purchased from time to time, but these

books never found their way to the library shelves. After being read by all who were interested in them, they were passed on to our neighbors from whom other stories were borrowed in return.

“Of course we took a secular weekly paper, our local Catholic paper, and the *Ave Maria*. The *Fireside Companion* and the *New York Ledger* somehow managed to find their way into our home in spite of the ban which my mother put upon such sensational stories as were to be found on their pages. Whenever these papers fell into her hands, she confiscated them and insisted on burning them, but not until she had first read all the stories which they contained, so as to make sure that her condemnation was entirely justifiable.

“Had it been the habit of the family to read aloud, it is likely that some of these stories would have awakened my interest and brought home to me a realization that reading was something more than a disagreeable drill in which the clever might show to advantage. But every one in our home read for himself. An

occasional news item was all that was ever read aloud.

“During my sixteenth year this situation was changed by a set of circumstances that at first sight would seem to have no conceivable relation to my mental development: A Total Abstinence Society had been organized in our parish a few years before the time of which I speak. Its funds, derived from monthly dues and fines, had been slowly accumulating until the treasury groaned under the weight of more than one hundred dollars. Whereupon it was determined to establish a circulating library from which each member would be privileged to withdraw one volume a week.

“The books in this library were bought to be read. It contained the works of Carlton and of Charles Lever, the Waverly Novels and such stories as Thaddeus of Warsaw, Dion and the Sibyls, Fabiola, Callista, The Children of the Abbey, the Scottish Chiefs, etc.

“Joe was the only one of us who belonged to the temperance society and he wanted to enjoy his privilege of taking out a fresh story

each week. Now, since after supper was practically the only time that could be spared from work, it was clearly impossible for the members of the family to read the book severally, as they wished to do, so it was finally agreed that Joe should read aloud during the long winter evenings.

"I was not at all interested in these stories. They were long and to me unintelligible; but I had my choice of keeping still and listening or of going to bed with the chickens, so I stayed. I paid no attention at first but tried to get some one to talk to me about the events on the farm or the gossip of the neighborhood. Every little while we were called to order and threatened with bed if we did not remain silent. Little by little, episodes in some of the stories caught my attention. At one time there would be some wild horse-play from one of Carlton's stories, or a wild chase after the smugglers. Gradually, I became more and more interested in certain of the stories that possessed action but very little literary merit.

"Affairs reached a crisis for me on Ash

Wednesday night, when, like 'Grandfather's Clock,' Joe stopped reading aloud. He was reading Redmond, Count O'Hanlon, or the Irish Raparee, and on the night before, he had left the robbers in a cave in the midst of a highly exciting *mêlée*. For us, Lent was a time of early to bed and early to rise, and moreover, night prayers and the rosary were said in common by the family shortly after supper; so Joe determined to read for himself alone, as he could do this so much more rapidly than he could read aloud.

"My imagination had been fired by the story and I asked him to finish it for me, but he paid no attention. The next day I found mother at leisure and begged her to read it for me, but her answer was, 'What interest can it have for you?' I begged my sister next, but she was afraid of being caught reading aloud to the *omadhaun*. Fortunately, the story was nearly finished and the print was large, so I took the book out to the barn and began to spell it out for myself, studying each letter in turn and pronouncing each syllable. My progress was slow enough, but I managed to finish the story."

CHAPTER XXXIV

The Turning Point

“Don’t you consider it a fortunate circumstance, Doctor, that your brother stopped reading the story where he did, and that the other members of the family refused to finish it for you?” asked Miss Ruth. “Did not your joy over discovering that you could read for yourself more than compensate for the pain inflicted by their refusal?”

“To answer your question is not so simple as it might seem. There are a great many things to be taken into consideration. Of course, on the whole, I suppose I should consider the circumstance fortunate, but it was not an unmixed blessing. For instance, I contracted the habit of pronouncing each syllable aloud as my eye rested upon it, and this gradually hardened into a locked synergy between the movements of the eye and the movements of the vocal organs.

"It was many years before I discovered the evil consequences of that habit, and then it was too late to remedy it, so that to this day, if my eye wanders to the last syllable of a word while I am trying to pronounce the first, I stumble hopelessly. The moment my eye passes from the note that I am singing, the vocal cords refuse to hold the pitch. As will readily be understood, this is a rather serious handicap to one who is frequently called upon to read and sing in public, and it makes singing from the score practically impossible.

"If I had had proper assistance in this new attempt to read, these consequences might easily have been avoided. So that being forced to spell out the last chapter of the story unaided had its dark side, and at the time there was nothing in the achievement calculated to give joy.

"You see, it really wasn't learning to read. I could have read much better eight years previously, and I was only conscious, as I plodded my way through the closing chapters of the story that I had lost whatever little ability I

once possessed in this line. During the years that I spent away from school, and in which I made no attempt to read, the printed word had grown unfamiliar to my eye. The contrast of the present with the past was decidedly discouraging. Moreover, I could hardly have helped contrasting my lumbering attempts to read with the excellent reading to which I had been listening all winter.

“Nevertheless, the spelling out of the words in those closing chapters of Redmond, Count O’Hanlon was a turning point in my life. The incident involved many things the full significance of which I did not understand until I took up the study of pedagogy years afterwards.

“Perhaps the most significant element in the situation was the motive that prompted this attempt to read. Reading in school was an entirely different affair. There the form was everything; the meaning was neglected. We devoted all our efforts to the correct pronunciation of the words, to the pauses, to the emphasis, and to the inflections. It was purely a

gymnastic drill. What should have been the means was made the end. There was no soul, no life in the work. It was but another instance of the truth of the gospel maxim, 'The letter killeth, it is the spirit that giveth life.'

"After all, it was probably fortunate for me that these early attempts to read failed; because they were along false lines, and temporary success could only have led me further from the true lines of development and induced me to accept the shadows for the substance.

"My bungling attempts to read without the aid of a teacher at the age of sixteen, as I lay on the hay mow and pondered each syllable in turn, had in them something infinitely better than could have been produced by the best achievements along the old lines where the form replaced the substance in the focus of attention.

"My reading was wretchedly poor, judged by any standard of elocution, but it was reading for content, and not for form, and in this respect it was a germ of mental life that was destined to have a large and vigorous growth.

It opened the door, however, slightly, to new worlds that contained the accumulated treasures of all the ages.

"The very difficulty which I encountered in this attempt to read was not without its advantages; it compelled me to read slowly, and my imagination thus secured time to complete each detail of the picture as I read. I could see the play of the sunlight and the shadow, I could see every detail of the garments of the actors in the scene, the expressions on their faces, their attitudes and their manner of walking.

"In the course of time the inward drama that refused to be clothed in words mirrored itself for me in the clouds or in the clear blue sky, in the winds and waves, or in the sordid and hideous surroundings of festering human life in our great cities. The knowledge derived from books was thus thoroughly correlated with the previous content of my mind and unity in the developmental process was secured.

"Fluency in speech has often proved a fatal gift. It deceives the thoughtless multitude

who mistake the 'windy suspirations of forced breath' for eloquence, and glittering generalities for profound knowledge, and in time, the possessor of this fatal gift deceives himself and comes to accept the popular estimate as if it were the verdict of the competent.

"I sometimes think that too great ease in reading leads to similar results. The eye runs over the printed page at such a rapid rate that it renders it impossible for the mind to grasp more than the mere outlines of the thought, and this mental food is so thin and unsubstantial that it cannot minister to healthy mental growth."

CHAPTER XXXV

A Resolve

"We all have our hours of depression. Even the radiant joys of childhood suffer brief eclipse from time to time, and adolescence is characterized by more or less prolonged periods of the dumps, from which even the most fortunate surroundings will not secure immunity.

"There was very little sunshine in my youth; all the circumstances were unfavorable, and I suffered accordingly during periods of the blues which reached their most acute stage in my sixteenth year. At this time the level monotony of my earlier years was beginning to break up. My mind, as we have seen, was developing rapidly along several lines, and it carved more food than the immediate environment supplied.

"The stories that I had listened to during

the previous winter gave me glimpses into an outer world that had been hitherto unknown to me. Literature, in the better acceptation of the word, was wholly beyond me. But the occasional incidents that dealt with the rough life of rough men in those stories reached my intelligence and awakened my interest.

“At this time, reading was in itself distasteful to me, nor had I formed any conscious purpose of acquiring proficiency in the art or of developing my mental powers. I simply craved the excitement and the companionship that were denied me in my immediate environment. The occasional incident that appealed to me in the books that Joe had been reading aloud was hidden away in matter that was beyond my comprehension; hence, in my hours of loneliness and depression, I naturally turned elsewhere to find suitable reading matter.

“Many of the workmen on the farm were from the pineries of the north, or from the mining camps of the west. They were rough in manner and rough of speech, and their stories were, for the most part, of drunken brawls.

and of the wild life of the frontier. I knew these men. I had seen them fight, I had listened to their stories, and now, when the blue devils laid hold of me, I naturally turned to the wild west literature of which the men usually had an abundant supply.

"These stories were short; the print was large; the paper was poor. In fact, they were cheap in every sense of the word. The language was ungrammatical and vulgar; the moral tone was low; but they were all action. In such stories as 'Buffalo Bill,' 'Rosebud Rob' and 'The Giant of the Gulch' there was not a dull line for me, nor a passage that was above my comprehension.

"Had they known of it, my parents would not have permitted me to read these stories, but they were busy about other things, and my repeated failures to learn to read had naturally lulled them into a false sense of security against danger from this source where I was concerned.

"That Fall all the workmen were discharged, as we were about to move to a smaller farm.

This cut off my supply of wild west literature, but it had fulfilled its mission for me; it had built up in me a habit of reading that had grown into a passion. My taste had not improved, nor were there any valuable additions to my store of knowledge; but in the absence of the literature that I would have preferred I was compelled to turn to other sources for the reading matter that had become a necessity to me.

“As I have said, the *Fireside Companion*, and the *New York Ledger* occasionally found their way into our home and to these I now turned in my hours of loneliness. The stories here were sensational and had not much to recommend them, either from a moral or from a literary point of view, but they were in every respect superior to the stories I had been reading.

“The supply from these sources, however, was limited, while something to read had become an absolute necessity to me on rainy days and when the blue devils attacked me. On one of these occasions in the spring of

1879, Mrs. Southworth's *Ishmael*, or *In the Depths*, and its sequel, *Self Raised*, or *From the Depths*, fell into my hand.

"As I still read very slowly, it took me several weeks to read these two volumes; but to me they were worth all the time that I gave them. In fact, the reading of these books marked a new stage in my development.

"I saw myself reflected in *Ishmael*; he was a companion in misery. His 'depths,' though different in some respects from mine, were equally deep. Hand in hand with him I climbed, step by step, up out of the gloom into the sunshine of hope. With him I followed the old negro Professor of Odd-Jobs around the plantation and learned to make myself generally useful; with him, I lay on the cabin floor, while the old negro taught us to read from the tattered pages of the family Bible; in the light of his conduct, I realized that my sullen manner and violent temper were mistakes, and I resolved to control myself and to be obliging to every body henceforth.

"Of course I had sense enough to realize that

it was all a story, but this realization did not diminish the effect upon me of Ishmael's conduct. It was possible to come up out of the depths! This was the matter of supreme importance to me. Moreover, I had caught a glimpse of the manner in which this ascent might be accomplished. Ishmael reached the United States Senate and became a great and good man. Of course I did not expect to imitate him in this, but as I closed the book I resolved with a resolution in which the energies of my whole being were concentrated that I would rise from the condition in which I had lived for years. That the ascent would be slow and difficult I did not doubt, but no difficulty would have daunted me in that moment of exaltation."

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